THE MAXWELL LAND GRANT.

The Title to Two Million Acres in Dispute—Suit to Set Aside a Patent.

DENVER, COL., December 5.—To-day in the Federal Courts here was begun a suit which is probably the largest ever brought by the Government for the recovery of lands alleged to have been fraudulently obtained through a patent. Suit is brought for the recovery of nearly two million acres of valuable land lying in Colorado and New Mexico, which are now owned by the Maxwell Land Grant Company, a syndicate composed of Holland capitalists. The papers filed to-day are an amended complaint to a suit begun in August, 1882. That suit was brought for the reclamation of about 500,000 acres from the same grant. Testimony recently taken developed greater frauds than were at first supposed to exist, and hence the suit for the recovery of the 1,500,000 additional acres. The matter was laid before Attorney General Brewster, and he authorized the institution of the new proceedings, employing Hon. J. A. Bentley, ex-Commissioner of Pensions, to conduct the case in the interest of the Government. The papers filed to-day are of a very sensational nature, as they allege that ex-Senators Chaffee and Chilcott, of Colorado, and Judge Holly, of New Mexico, were knowing parties in the scheme to defraud the Government out of a patent to the large tract of land which is now estimated to be worth anywhere from $10,000,000 to $20,000,000. Should the Government win the suit by setting aside the patent obtained in 1879, the Hollanders would have only a few thousand acres of land to show for the millions they have expended. Should the patent be declared valid the Dutchmen will have made a good investment in the grant.

HISTORY OF THE CASE.

The history of the case, as recorded in the complaint, is deeply interesting: Previous to the Gaudaloupe-Hidalgo treaty of the United States with Mexico, the Mexican Government granted to Gaudaloupe Miranda and Charles Beaubin a tract of land situated in Northern New Mexico. This tract consisted of twenty-two leagues of land, or 97,000 acres. Between that time and 1869 Lucian B. Maxwell became owner of the grant, he buying the lands of the two Mexicans for stated sums. In May, 1869, Maxwell gave an option bond to Chaffee, Chilcott and Holly for the sale of the lands. The charge is made that this was the first move in the scheme for enlarging the boundaries of the grant. In December, 1869, Hon. J. D. Cox, then Secretary of the Interior, decided that the grant consisted of 90,000 acres. In January, 1870, Chaffee, Chilcott and Holly employed Griffin, a Deputy United States Surveyor, to survey the outside boundaries of the grant. During that summer Griffin prosecuted his work, running the boundary lines so as to include 2,000,000 acres. In May, 1870, the Maxwell Grant Railway Company was incorporated, the papers stating the principal object to be the purchase of the Miranda Beaubin land grant. On June 12th Chaffee, Chilcott and Holly assigned their option bond to the newly incorporated company. In July Maxwell conveyed the grant to the railway company. This company filed the Griffin survey with the General Land Office at Washington, and applied for a patent, but it was refused for the stated reasons that Griffin was not employed by the United States to make the survey, and it was not, therefore, valid. The company continued to claim a patent on the land until 1877, when it succeeded in inducing the officers of the Government to believe that a certain decision of the Supreme Court of the United States had overruled the decision of Secretary of the Interior Cox, and made their last demands for a patent under the Griffin survey, which was again denied.

HOW THE PATENT WAS OBTAINED.

With a view of obtaining the property in an authenticated way, in August, 1877, a contract was made with Elkins and Mormon, Deputy United States Surveyors, to make new surveys. They substantially certified the Griffin survey, under which a patent was given from the General Land Office. This is the patent which the Government now wishes to have set aside, on the grounds that it was obtained through fraud. The complaint alleges that the boundaries were extended for the purposes of taking in nearly 300,000 acres of the best coal lands in Colorado, and about the same amount of valuable mineral land in New Mexico lying east of Red River. After Chaffee, Chilcott et al. obtained possession of the immense property they formed a new company, sent their agents to Europe and disposed of the bonds of the company to the Dutch syndicate which now owns the grant. The large amount of cash received from the Hollanders, the complaint alleges, was divided among the men who knew at the time of the transaction they were parties to a fraud. The Hollanders obtained possession of the grant by foreclosing the mortgage which Chaffee et. al. gave them for the money.

The grant has been much improved since the Hollanders took possession of it. Now it is worth $5, $10 and $15 an acre. Attorney Bentley, who has been in New Mexico for several weeks taking testimony, says that each and every item in the complaint can be proven, and that the grant fraudulently obtained will be wrested from the Hollanders and vested in the United States.—*Globe Democrat.*

RAILROAD TIES.

"The railroads of this country," said an official of the trunk lines running out of New York, "pay nearly $6,000,000 a year for crossties. The timber used is oak and chestnut in the East, and oak, cherry, locust, maple, and ash in the West and South. The best ties are made of oak. More than 225,000 acres of forest are needed to supply these ties every year, and consequently the necessities of railroads in this one item alone forms a considerable item in the destruction of our forests. The country along the line of our road alone annually supplies us with hundreds of thousands of oak and chestnut ties, and thus far we have not been compelled to go out of our own district for our supply. One county in Pennsylvania alone (Pike) furnishes a large proportion of our ties, and has for many years. There is not a station in that county that is not a supplying depot for ties. I have often wondered where they all come from, for the contractors who operate in that county, after more than twenty-five years, chopping and hewing in her forests, never hesitate to contract for the delivery of as many ties as are called for. They are brought in as far as twelve miles from the railroad. Besides the large number that we annually receive, there is a railroad on the other side of the county which also depends on Pike county for a large share of its ties. For more than twenty years also, up to the time that we adopted coal instead of wood as fuel, Pike county furnished the road with many thousands of cordwood every year—oak, chestnut, pine, beach, birch, maple, and hickory. Besides these drafts on her woods, the county's best young chestnut trees have been cut for more than thirty years to help us in renewing our telegraph poles.

"Railroad ties need renewing every three years. In building a new road the estimate is 2,700 ties for the mile. It is safe to say that it will require 300 ties a year to keep a mile of road in repair. From 12,000,000 to 15,000,000 new ties are required by the railroads every year. In building the great Western railroads the contractors, in many cases purchase outright the timber along the route, or as near to it as possible. In that case they pay $20 to $25 an acre. Otherwise they pay from 10 cents to 12 cents apiece to the owner of the land for the ties taken out. The average price paid to the tie contractor is 35 cents apiece, although we have paid 45 cents and even 50 cents for the best oak ties. We prefer hewn ties to sawed ones, and use no others, but many railroad men do not believe in the theory that they are any better. It may be only a superstition that the former last longer than the latter, but if it is, it is so strong with us that we insist on having hewed ties. Of late years we have taken a great many hemlock ties, experiments proving that they can be used to advantage in many instances, on sidings and on tracks where the traffic does not require constant repair."—*N. Y. Sun.*

HANS MAKART has turned from painting to architecture, and is in Vienna designing a Gothic cathedral that is to cost $8,000,000.

CELLULOID, so called from its being derived from the cellular tissue of plants, is a composition of gun cotton or tissue paper and camphor subjected to a high degree of pressure of heat.

THE New York village of Little Falls is about making a public green of the land occupied by the old canal, under an act of the Legislature passed last winter. The canal was the first made in this country, being part of the plan by which river communication was improved from the Hudson to Seneca and Ontario lakes near the end of the last century. The course was three-quarters of a mile long, had several locks to overcome the fall of 39 ft. in the river, and cost $197,000. A private corporation did the work, but finally the property passed into the hands of the State. One of the old locks is to be preserved intact.

THE CANADIAN PACIFIC R. R.

OFFICIAL REPORT ON KICKING HORSE PASS.

In view of the success of Major Rogers in his exploration of the Rockies, and the final adoption of the Kicking Horse Pass for the C. P. R. R., the official report will be found of interest. It is as follows:

The results of the surveys on the Mountain division made during this year, 1883, are briefly as follows:

A line of definite location from the summit of the Rocky Mountains to the summit of the Selkirks to the west crossing of the Columbia (opposite the mouth of the Eagle pass), a distance of 43 miles.

The route adopted proceeds from the summit of the Rockies westerly down the Kicking Horse River 44.70 miles to the valley of the Columbia, which it follows in a northwesterly direction nearly thirty miles, until it enters the Valley of the Beaver, which it follows southerly and westerly for about twenty miles to the summit of the Selkirks. From this latter point it descends westerly down the east fork of the Ille-cille-wait, about twenty miles to a junction with the main stream, which it follows northwesterly about twenty-three miles to the west crossing of the Columbia. A maximum gradient of 116 feet per mile is found necessary in the descent westerly from the summit of the Rockies down the Kicking Horse Pass for a distance of about seventeen miles, and again for a distance of two miles in the Lower Kicking Horse.

The same gradients are used in the ascent of the Selkirks for about sixteen miles, and for nearly twenty miles down their west slope. In no instance is this rate of grade exceeded, and a proper compensation for curvature is made in every case by a reduction of the rate of grade.

We have used a maximum rate of curvature of 10 degrees, mainly in Kicking Horse Valley; but only an occasional use of that rate of curvature in the canyon of the Columbia and in the Selkirks. I am confident, however, that in the final adjustment of the line after the right of way shall have been cleared, a material improvement will be made in this respect.

There will be three crossings of the Kicking Horse in the upper valley and eight in the lower, all of one span, and no span exceeding 200 ft. The first or easterly crossing of the Columbia will require a bridge 350 ft. in length, and the west crossing about 800 ft.

The heaviest work to be encountered in construction lies in the upper Kicking Horse, where about six miles may be classified as hard mountain work, with about two miles of hard work near the mouth of the Kicking Horse, the remainder averaging from medium to light. For ten miles near the bend of the Kicking Horse and twenty miles in the valley of the Columbia the work will compare favorably with that in the Bow Valley. In the six miles of the Columbia canyon the work may be rated as two miles' hard work and the remainder light. Through the Selkirks the work is more uniformly distributed than through the Rockies and presents no special engineering difficulties, and for mountain work may be considered moderate, the percentage of rock being unusually small.

Estimates for the entire line in sections of one mile each accompanying the plans and profiles submitted with this report:

Tunneling will be required as follows:

	Lin. ft.
In Upper Kicking Horse	1,800
In Lower Kicking Horse	2,400
In Columbia Canyon	2,200
In east slope of Selkirks	none
In west slope of Selkirks, not to exceed	1,200
Making a total of	7,600

Longest tunnel, 1,400 feet; next in length, 1,000 feet; others from 150 to 600 feet in length.

I am glad to state that my expectations of the feasibility of the route adopted have been more than realized. By the results of the surveys of this year and as shown by the plans and profiles the work is of such nature that any desired force can be used on the construction, and with a certainty of the greatest dispatch in its completion.

The track having reached the summit of the Rockies there remains a gap of not over 270 miles to be completed between that point and Kamloops.

The elevation above the sea level of some of the prominent points on the line are as follows:—

Summit of the Rockies	5,300 feet
Bend of the Kicking Horse	3,647 "
Mouth of the Kicking Horse (in Columbia Val)	2,541 "
East crossing of Columbia River (grade)	2,592 "
Summit of Selkirks	4,516 "
West crossing of Columbia (grade)	1,426 "

The highest elevation attained is that in the Rockies, 5,300 feet. The highest elevation to be overcome in the gold range is the Eagle Pass, which is not more than 400 feet higher than the west crossing of the Columbia.

WHY SHOULD IRON MEN BE NERVOUS.

The New York *Tribune* in its weekly review says: "Some iron and steel works have discontinued operations on account of low prices, but additional contracts by others are reported, and the statement by the Secretary of the association is considered highly encouraging." This seems proper to us, and shows that a careful examination of some of the causes for the present dull times in iron manufacture should be removed if owners expect to continue in business. The *Bee* thinks it is time furnace men began looking at the cost of royalty at mines on ore, which is too high. Railroad freights on iron-ore in the Upper Peninsula country are out of all proportion, as there is no good reason for paying the original cost of a railroad to iron-mines back to the railroad company *annually* in freights, as reported is done to one or two railway companies in the Lake Superior regions. Another item worthy of attention is the closing of contracts for lake freights on ore earlier in the season, thus obtaining lower rates on this end of the line, previous to the demands made on vessels for transporting grain and coal later in the season. Another thing which may not be out of place to mention would be a suggestion that furnace-men employ founders or superintendents who can see and know that iron is not run out into cinder-drains as cinder. We recently saw cinder scrap, bought as cinders in a prominent machine-factory yard, that was almost *pure pig-iron*. No furnace can expect to make money run as carelessly as that indicates. Perhaps the owners are very indignant at any "meddling with the tariff," when a little old-fashioned good common-sense was all they required to run their business profitably even in these times, hard as they are for iron men. And on wrought iron, or what is known as merchant or bar iron, some suggestions may not be out of place, as men get into ways of doing business that often aprear curious to outsiders. Why should iron-sellers haul their stock to fine stores and back to depots again; and be subject to high rents, insurance, and extra labor? Why not have well-located offices for meeting customers and have roomy warehouses on railroad-tracks or docks where their stock of iron can be run into them and handled at lowest net cost to consumers? Why pay such fabulous salaries to officers for moderate service? Why pay puddlers and rollers such wages? Look right at the men; what are their capacities as compared to their associates? Why this unjust discrimination in compensations?

The people demand that the cost of iron shall be reduced, and it must come down. The sooner manufacturers adjust themselves to the change the better for the whole country.—*Toledo (O.) Bee.*

THE PROGRESS OF THE WORKING CLASSES in the last half century formed the subject of a recent interesting address by Mr. Robert Giffen, the President of the Statistical Society, before the Royal School of Mines in London. According to Mr. Giffen the material condition of the working classes has greatly improved during the last fifty years. By reference to the record of wages for that period the learned statistician discovered that in all cases where he had found it possible to make a comparison from the apparent similarity of the work there was an enormous apparent rise in money wages, ranging from 33 to 85 per cent., but even this he thought underestimated the real extent of the change. While the money wages of the working class had thus increased their hours of labor had diminished. He was inclined to say that this diminution was very nearly 20 per cent, The workman of to-day receives from 30 to 100 per cent. more money for 20 per cent. less work—in round figures he has gained from 50 to 100 per cent. in money return in fifty years. In regard to change in price of commodities, the lecturer said that his researches led him to believe that prices were very much the same as they were forty or fifty years ago. On the whole he said the sovereign goes as far now as it did fifty years ago, while on the other hand there are many new things in existence now at low price which could not have been bought at all. The prices of special articles were found to be lower instead of higher than they were half a century ago. This was the case with wheat especially. Sugar and such articles had largely declined in price, and clothing was cheaper now than formerly. The increase in the price of meat, however, was considerable. The same was true with regard to house rents, these being now on an average one and a half times what they were fifty years ago. Mr. Giffen said that the increased price in one or two articles —particularly meat and house rent—was insufficient to neutralize the general advantage which the workmen had gained.—*Bradstreet's.*

Northern Pacific—An Inside View.

THE STATEMENT OF GEN. HERMANN HAUPT.

ST. PAUL, Dec. 19.—A former high official of the Northern Pacific, who spent three weeks in New York last October, visited the general offices daily, and is on terms of intimacy with a majority of the directors of the road, says: "The bitterness of George V. Sim's statements in New York about Mr. Villard is due to the fact that he lost everything he had by the decline of Northern Pacific securities."

This gentleman also says that Frederic Billings has never recovered from his mortification at being displaced as President of the road by Villard, and has constantly opposed the latter. He has been kept accurately informed as to all the movements and intents of the management, and has consequently been in a position to do great harm. In his course he has been aided by Sims, formerly his private secretary, but lately secretary of Mr. Oakes.

Mr. Oakes is also a heavy loser through the stock depreciation, and has lost all, and was exceedingly nervous about his position last October, believing that he would accompany Villard into the outer world. How many more of the present Northern Pacific officials are heavy losers no one pretends to know—several, probably. Whether Billings will be Villard's successor or not is a question likely to be speedily decided.

Villard's resignation was decided on last October. Drexel, Morgan & Co. of New York and Drexel & Co. of Philadelphia are and were inimical in the sense that they must find a scapegoat, and he was chosen. Fault was found with what is called his looseness of management, and also with his placing in high salaried positions friends of the oldentime when Villard was a journalist. It is generally conceded that he is not a man of detail. He has a broad grasp and is a daring and successful financier, but of the railways themselves, their capabilities, prospects for earning dividends, &c., he knows very little as compared with either ex-President Billings or Vice-President Oakes. Drexel, Morgan & Co. stand in the same position to the Northern Pacific that Jay Cooke once did, except in the important particulars that the road is completed and not bankrupt. They staked their reputation on their ability to make its stock par and succeeded, only to see it, to their intense mortification, fall lower and lower until preferred Northern Pacific sank to 50, common to 25, and Oregon Transcontinental, which cost its possessors 83 cents in hard cash, go down below 35. A scapegoat being necessary Villard was selected to play the part. He will not be President of the Northern Pacific on New Year's day 1884. There is no doubt whatever that the fall of ten points in Northern Pacific after Villard had started on his famous excursion was engineered by Drexel, Morgan & Co. They were bears for the time, but started a downward rush they could not check, and in hurting Villard they also hurt their own prosperity for more than they believed possible.

THE NEW CABLE COMPANY.

The Mackey-Bennett Cable Company was incorporated December 12th at the Secretary of State's office, Albany, N. Y., under the name of the Commercial Cable Company. The certificate of incorporation gives the general route of the lines and the points to be connected therewith, to be from New York City, by one or more routes, to a point on the sea at or near Cape Ann, and thence through the New England States, Canada, and New Brunswick, or through such countries as may be found convenient, to a point at or near Dover Bay in the Province of Novia Scotia, and also by direct lines from New York to Canada, and thence to Dover Bay, and in both cases there to connect with one or more of the submarine cables of this company; also, from some eligible and convenient point on the Atlantic coast near Cape Ann, by submarine cables, one or more, as may be found necessary, to Ireland, England, France, Belgium and Spain, or to any one or more of said countries, with intermediate stations, if required, at all or any of the islands in the Atlantic Ocean; also, a land line or lines from a point on the coast of France at or near Havre to the city of Paris; also, a line or lines from New York City through the seaboard of Atlantic and Gulf States of the United States, and from any one or more of said States by submarine cable or cables to all or any of the West Indian or other islands in the Atlantic Ocean, and to the mainland of South America at such places as may be selected for this purpose, with offices if required for the transaction of business at all intermediate points and places; also, a line or lines from New York City through the United States to one or more points in the Republic of Mexico, and by another line or lines to one or more places in California and Oregon or either of them, and also from one or more points on the Pacific coast to Japan, China and Australia, with intermediate stations. The company under the acts of Congress assumes to itself the right to construct, maintain, and operate the lines of telegraph through and over any portion of the public domain of the United States.

The company likewise claims the right to use all its lines as telephone lines and to become the owners or lessees of all or any patents for inventions connected with telegraphy or telephony. The capital stock is $4,000,000 divided in 40,000 shares of $100, with power to increase said capital stock from time to time, and by such amounts as may be necessary to represent the cost of building and constructing the lines. The shareholders are John W. Mackey, Virginia, Nev., 20,000 shares; Isaac Bell, Jr., Newport, R. I., 10,000 shares; Hector De Castro, New York City, 5,000, and David B. Davidson, Brooklyn, 5,000.

Trial of the New "Grip" on the East River Bridge.

A reporter of the New York *Sun* thus describes a trial made on December 21st, of the new grip invented by A. H. Mathesius:

"At one o'clock an energetic little locomotive dragged car 14 out, and then pushed it over the cable, and a moment later Mr. Mathesius, in a rubber coat and a bridge policeman's hat, appeared. The party climbed down to a narrow wooden scaffold, on which the men stand who raise the cable for the grip now in use, and from which a good view of the new grip could be had. It is a very compact piece of mechanism. It is held in an oblong iron frame under the car, midway between the trucks, and occupies a space about three by four feet. Four stout steel perpendicular rods serve as guides, and allow the apparatus to be raised or lowered. The grip proper consists of two oblong pieces of steel, which, by the action of the same lever that lowers them to the level of the cable, can be made to clutch the cable. After they clutch it another motion of the lever lifts them and the cable up to the height necessary to keep the grip clear of the sheaves in the roadbed. The fact that the Mathesius grip can pick the cable up anywhere along the route, provided only that the car is brought to a standstill, is claimed as a special point of superiority over the Paine grip. The man in charge of the car can pick up the cable unaided.

The faces of the steel jaws which grip the cable are armed with pieces of brass, which are capable of sliding backward in grooves. When the jaws are first set against the cable, these pieces of brass are drawn backward in the grooves. Each groove reaches horizontally all around its jaw, the corners of the jaw being rounded so as to allow the pieces of brass to push each other entirely around the jaw. Although the pieces of brass are not united the groove converts them into a sort of chain, a part of which is always bearing on the cable.

When a certain amount of pressure is put on the jaws the increased friction prevents the pieces of brass from sliding, and when they come to a stop the grip, and the car to which it is attached, must necessarily be moving at the same rate as the cable, although when the cable was first clutched the car did not move at all, the motion then being confined to the sliding pieces of brass.

To prevent the cable from sustaining a part of the friction, the faces of the brass pieces are shaped to fit the spirals formed by the twist of the wire cable, so that as soon as the jaws are closed the cable catches the brass pieces and draws them along through their grooves at its own rate of speed. It is supposed never to slide past them. The reason brass is used is because it is softer than the metal of the cable, and it is desirable that whatever wear there is should come on the grip apparatus.

After a careful examination had been made of the grip yesterday morning, Mr. Mathesius ordered a workman on the car to lower it to the level of the cable. The lever was turned and the jaws opened wide and slid down the guides until the cable, which was running at the rate of three miles an hour, was between the two brass pieces. Then bolts had to be adjusted.

"Close the grip," at last called out the inventor. Then there was a rattling noise as the brass dies began to move around in their grooves. The car started off with a jump. Soon the dies stopped, and the car moved steadily along in the direction of New York. When it had gone 500 yards the cable was released. The little engine puffed up to the car and began to drag it back, while the occupants of the scaffold wiped the snow out of their eyes so that they could see what effect the action of the cable had upon the grip. It was found to be all right.

THE FIRST CANTILEVER IN AMERICA.

Written for Engineering News:

DEC. 22d, 1883.

EDITOR OF ENGINEERING NEWS:

Dear Sir:—At this time, when attention is attracted to the new bridge spanning the gorge of the Niagara river, a brief account of the development of the type of counterbalanced cantilever bridge on a large scale, of which the Niagara bridge is the first specimen erected, will undoubtedly prove of interest to engineers.

My object in writing is two-fold; first: that due credit may be given to the gentlemen in whose mind this application of the cantilever to a span beyond the scope of the ordinary rigid truss first found realization in this country; and second, to add an important page to the history of bridge engineering. A further reason for calling attention to the subject is the editorial on cantilever bridges, which lately appeared in your paper, conveying, I believe, an incorrect idea of the history of their development, concerning which you will undoubtedly wish the truth to appear.

The cantilever bridge seems to be destined in the future to occupy the middle ground between the straight girder on the one hand for short spans, and the suspension bridge for very long spans on the other. It avoids the serious defects of the latter at the same time that it possesses the great advantage of rigidity belonging to the straight truss.

It gives therefore a means of avoiding the use of the suspension system for spans too great to allow the building of the ordinary type of girder bridge, and it is somewhat interesting to note that the first bridge of the counterbalanced cantilever type of any magnitude investing it with importance designed in this country, did not originate in a desire for novelty, but was the result of a systematic study to avoid the difficulties of the suspension system.

In the year 1867-68, Professor W. P. Trowbridge, of the School of Mines, Columbia College, then Vice-President of the Novelty Iron Works, lived in Astoria, and realized the great advantage that a bridge communication between the two islands would offer. He accordingly conceived what can be attested to be the first use here of the cantilever principle in a design of large span. About the same time, and independently, appeared Mr. Baker's book in England on "long Span Railway Bridges" involving the same principal.

Opposite 76th street, Blackwell's Island lies in the middle of the East river, and his plan was to cross at that point by two spans, one of 720 ft., and the other of 600 ft., at a height of 135 ft. above the water.

This design, shown in Figure 1, has masonry piers 135 feet in height, and from them rise iron frame-work towers 150 feet higher. From the tower is built out the cantilever in both directions; on one side anchoring to the masonry of the pier, and on the other extending just half way across the span. The two cantilevers from opposite sides of the span meet at the centre, and are arranged with a sliding joint, to allow for changes of temperature. By this design the bridge is built up without false works, and a distance is spanned which would otherwise be impracticable except by a suspension bridge.

Professor Trowbridge interested several of his neighbors in the matter, among others Col. R. M. C. Graham, who was particularly active in agitating it.

It seems that in the year 1870 a company was formed during the Tweed regime for the purpose of throwing a suspension bridge across the East River at the upper part of New York city, but nothing was done, possibly because there was no precedent like the East River Bridge to encourage or perhaps discourage capitalists, but more likely because of the recognized job character of the whole affair. Col. Graham succeeded in getting control of this company, and it was recognized under the name of the New York and Long Island Bridge Co., *upon this design shown in Figure 1 as a basis.*

Professor Trowbridge about this time went to Yale College as Professor of Engineering, and for the time carried the designs no farther than the general plan illustrated.

Fig. 1.

FIRST DESIGN OF PROF. TROWBRIDGE.

Mr. Harding, however, who became engineer for the company, went to Professor Trowbridge and obtained permission to use his design and work up the details. He followed Professor Trowbridge's suggestion in reducing the length of the cantilevers and connecting them at the centre of the span by a rectangular truss of 180 ft. span; but he did not follow the advice to diminish the height of the towers, nor did he arrange the tie rods parallel. His drawing—credited in the title to Professor Trowbridge—with the tie rods radiating from the top of the tower, and with the central connecting girder, was exhibited in the office of the company for a year or more.

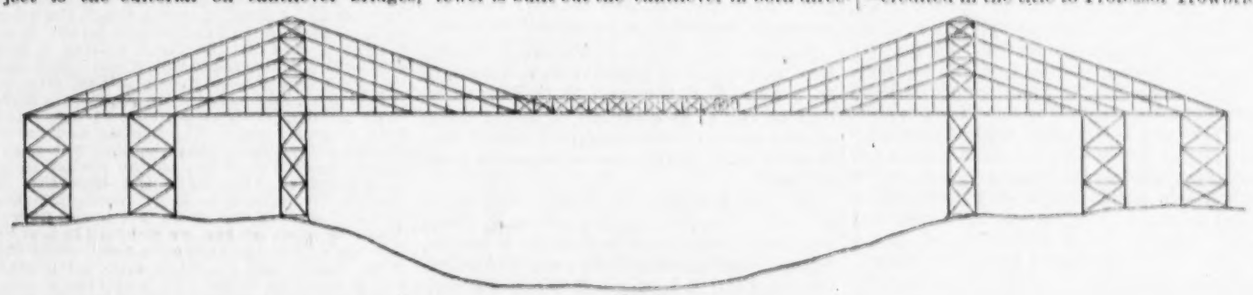

Fig. 2.

SECOND DESIGN OF PROF. TROWBRIDGE.

As by this drawing Professor Trowbridge was to a certain extent made responsible for a design he did not approve of in every particular, he presented to the Secretary of the Company a drawing embodying his views, which drawing is represented in Figure 2.

It shows the substitution of braced iron pillars for the masonry piers, the reduction of the height of the towers, and the independent girder in the centre of the span resting on the cantilevers.

He also suggested that the company should appoint a commission to receive designs in competition. This suggestion was acted upon and a commission formed in 1875, consisting of General Barnard as Chairman, General Gilmore, and Mr. O. Chanute. Professor Trowbridge's second design, which, as we have

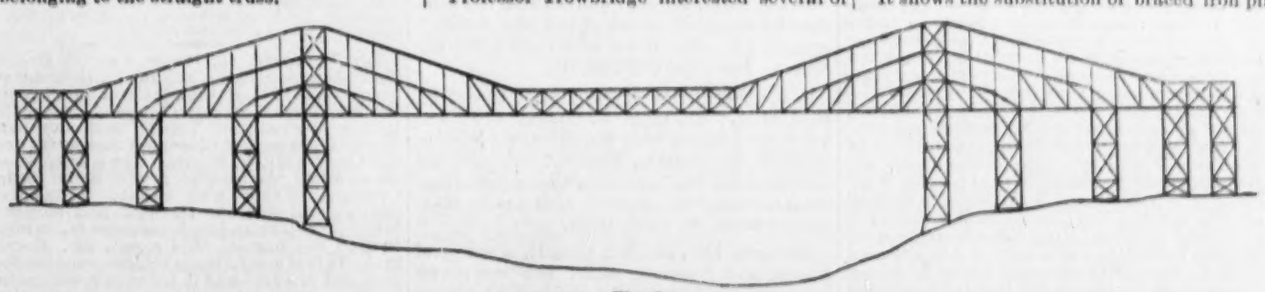

Fig. 3.

ACCEPTED DESIGN OF CHAS. MACDONALD.

seen, was practically the one on which the company existed, was shown to the Chairman of the Commission, who was so much pleased with it that he urged Professor Trowbridge to make detailed drawings and enter the competition. This he was unable to do for want of time.

Of the ten or twelve designs presented to the Commission, the one finally accepted and rewarded with the first prize was that shown in Figure 3, made by Mr. Macdonald, now President of the Delaware Bridge Company. Professor Trowbridge's first designs had already been extensively illustrated in the New York *Tribune;* the transactions for 1873 of the Connecticut Academy of Sciences, and by various pamphlets, and it seems inevitable that Mr. Macdonald must have, in a perfectly legitimate and honorable way, devised the conception of his design from these publications. There is a singular illustration of the truth that good designing, having given the same conditions, always tends to arrive independently at the same result, in the fact that this design of Mr. Macdonald's (Figure 3), made in answer to the advertisement of the Commission, and the design by Professor Trowbridge (Figure 2), made before the Commission, was suggested by him, agree so closely that one description will answer for both. They are almost identical in form and in dimensions,

The main points I wish to emphasize in what precedes are that, the first design ever *formally accepted by a Commission*, for a cantilever bridge of large span was this one by Mr. Macdonald, which agrees somewhat with the statement in your editorial that "the first design for a large span ever accepted was made by Charles Macdonald, President of the Delaware Bridge Company, of New York, for the New York and Long Island Bridge Company;" that almost identically the same design had been submitted to the company by Professor Trowbridge, even before the Commission which called out Mr. Macdonald's design had been suggested; that the existence of the company itself was based upon this design of Professor Trowbridge's; and finally, that the primary idea of applying the cantilever to large spans in American bridge building first, crystalized to definite form in the mind of Professor W. P. Trowbridge.

As adding authority to this statement I will insert the following letter signed by Mr. Graham, the Secretary of the New York and Long Island Bridge Company:

DECEMBER 17, 1883.

"The historical interest which seems just now to be attached to the cantilever system of bridges of great span renders it proper to state that the New York and Long Island Bridge Company, which contemplates building a bridge across the East River at Blackwell's Island, where one of the spans is 720 feet, was organized in June 1874 on the special design for such a bridge submitted by Professor W. P. Trowbridge, formerly Vice President of the Novelty Iron Works, and that these special designs exhibited by him and showing the advantages of the cantilever system for such great spans were substantially the same, and in many respects almost identical with the cantilever plan formally accepted by the company in 1876, as designed by Mr. Macdonald.....It is proper further to state, that Professor Trowbridge, having accepted the chair of Engineering in Yale College, recommended to the company the selection of a Commission of Engineers to receive and decide upon plans, although stating at the time, that he would be unable for want of time to enter into the competition: his only object being the success of the enterprise to connect New York and Long Island across the East River at Blackwell's Island."

(Signed) R. M. C. GRAHAM,
Sec. of N. Y. & L. I. Bridge Co.

It is unnecessary to say that no bridge yet spans the river at the upper part of the city, but it is only a question of time before the growing necessity of easy and certain communication in that section will demand a rival to the great East River Bridge, and we may yet see this grand application of the balanced cantilever in a more definite form than on paper. It is an interesting fact that in the transactions of the Connecticut Academy of Arts and Science of some ten years back is to be found an illustration by Professor Trowbridge showing how his system could with advantage be applied to span the Niagara river gorge, which differs mainly from the new bridge over that river in having the cantilevers above instead of below the track, and the members consequently as tie-rods instead of struts.

Very truly yours,
J. L. G.

Seaboard, Pennsylvania and Western Railroad.

This road is a consolidation of the Seaboard, Pittsburgh and Great Western Railroad, and the Delaware, Water Gap and Southwestern Railroad Companies.

The first named road was chartered September 27th, 1881, with a capital of $2,100,000, and was to run from a point on the Baltimore and Cumberland Valley Railroad, near Green Village, Franklin County, Pa., to a point immediately west of Pittsburgh on the Ohio River, a distance of 310 miles. The directors were E. L. McCononghy, W. F. Hirones, E. G. Price, H. C. Lincoln, J. J. Summers, B. F. Stratton, and F. F. Baltz, of Philadelphia.

Of the subscribed 42,000 shares 41,960 were credited to McCononghy.

The 6th day of last November a charter was issued to the second named road, which was to run from near Hyndman, Bedford County, Pa., on the Baltimore and Ohio Railroad, to Smithfield Township, Monroe County, near the Delaware Water Gap, a distance of 255 miles.

The directors were: C. Fallor, President; Rees D. Fell, A. G. Lindsay, W. E. Taylor, G. M. Kinsel, J. J. McGiver, E. R. Fall, G. W. Hebron and C. P. Hawkins, of Philadelphia. Of the 51,000 shares subscribed, 50,960 were credited to R. D. Fell, the capital stock being $9,600,000.

The new company, the directors of which are: McCononghy, Janney, Hirones, Price, Lincoln, Summers, and Baltz of the Seaboard, Pittsburg and Great Western; and W. Stabler, of Springfield, N. J., and L. H. Cress, of Brooklyn, N, Y., proposes to use the foregoing charters, and to build a line from near Delaware Water Gap to Alleghany County, Pa., with branches from Hyndham, Bedford County. and Green Village, Franklin County.

Engineers are now working their way, under this company's direction, from Blair County across Bedford County to Hyndman.

The President is R. M. Janney, of Philadelphia; the Treasurer, S. E. Heasly, of Brooklyn, and the capital stock $11,500,000.

THE St. Paul, Minn., *Pioneer Press* has published a complete review of the new railways projected in 1883. It has been copied into the *Railway Review* of Chicago, Ills.

IN the recent fire in the Drake Block, St. Paul, Minn., MR. CHAS. F. LOWETH, C. E., lost his library, notes, etc. MR. LOWETH wishes to purchase ENGINEERING NEWS for 1880-81-82 and will be pleased to hear from any party having them for sale. His address is Room 12, Manheimer Block, St. Paul, Minn.

NEWPORT, Dec. 24.—MR. GEO. H. NORMAN of Boston and Newport began life here in an humble way. Many years ago he kept a shoemaker's shop. Then he studied civil engineering, and later became proprietor of a local daily newspaper. He afterwards built the gas works and the Newport water works. He has been successful in everything he has undertaken, and is now several times a millionaire. He is a generous man, a fact that has been proved to-day. He has here two sisters, two nieces, and two nephews, to each of whom he sent from Boston a check for $5,000 as Christmas gifts—$30,000 in all. Mr. Norman spends his winters in Boston. He owns one of the magnificent residences in Newport.

THE FORTH BRIDGE.

One of the four caissons which will form the foundation of the large span on the South Queensferry side of the Forth has just been completed by Messrs. Arrol Brothers, of Glasgow. All the caissons will be of similar construction, though slightly varying in height to suit the inequalities of the surface on which they will rest. Each of them will be 70 feet in diameter, varying from 46 to 64 feet in height, with an inclination of 1 in 46. The one which is just completed, and of which the others will be *fac-similes*, is built up in plates, and is constructed in the most substantial manner. It consists of two skins, an outer and an inner, and these, which are placed 7 feet apart, and are made of iron varying from three-eights to five-sixteenths of an inch in thickness. Seven feet from the bottom the inner skin is made to slope outwards at an angle of about 45 degrees, and, joining the outer skin at the point, forms what is known as the shoe, which is entirely composed of Hallside steel. The cutting edge of it is formed of two 6-inch angle-irons, three-quarters of an inch thick, placed back to back. To these the junction of the outer and inner shells is rivited, the whole of this cutting edge being bound on the inside by a half-inch plate, and on the outside by an inch plate 18 inches deep. Between the outer and inner skins there are heavy diagonal angle-iron bracings, placed horizontally and vertically, and the whole plates are to be caulked so as to make them thoroughly watertight. Between the skins there are bulkheads, in order to divide the space into ten compartments, the object being to facilitate the sinking of the huge piece of metal. In the inside four main girders are carried across the floor of the caisson at equal distances from each other, and these are taken right through the outer skin, so as to give more strength, and prevent any chance of collapse by the pressure of the water on the outer shell. Just at the point where the inner shell turns toward the angle to form the shoe, a floor or roof of ¾-inch iron plating is laid across, and is also made watertight. It is carried by means of four strong latticed girders, 18 feet deep, and to these are attached a sufficient number of cross-girders, to make the floor perfectly rigid. These main and cross-girders are so placed that the floor will resist an air pressure of 30 lbs. to the square inch. It is intended that while the operation of sinking the caisson is being performed the men will work in the seven-feet space underneath the floor, access te which will be had by three tubes reaching to above the level of the of the water, and all fitted with the necessary air-locking doors. It is estimated that there will be about 400 tons of iron in each caisson.—*The Architect.*

ELEVATORS AT NEW YORK.—The following is an abstract of bids for furnishing and erecting two steam freight elevators, one in the Assay Office building and the other in Public Stores building, corner Laight and Washington streets, New York city:

ASSAY OFFICE BUILDING.

Copeland & Bacon, $2,466.
George C. Howard, $2,721.
Otis Brothers and Co., $2,725.
Whittier Machine Co., $3,525.

PUBLIC STORE BUILDING.

George C. Howard, $4,432.
Ottis Brothers and Co., $5,272.
Whittier Machine Co., $5,760.
Copeland and Bacon, $6,660.
The award has not yet been made.

THE Delaware, O., bridge was let Dec. 21. Nine of the companies bidding for the contract were counted out at the last meeting, leaving the Mt. Vernon Bridge Company, the Smith Bridge Company, of Toledo, and the King Bridge Company, of Cleveland, the latter represented by Mr. V. Morris. The commissioners awarded the contract to the King Bridge Company, of Cleveland, to-day. It was conceded by all this was the best and cheapest bridge, notwithstanding itwas some $1,500 higher than the lowest. The agent, Mr. Morris, said: This is a very large bridge—over 240 feet long and 24 wide—and it being in a very prominent position will attract much attention. They will go to work at once and in less than two months it will be completed.

THE bids of the erection of the new Scientific School for Dickinson College, Carlisle, Pa., were opened on Dec. 20. Ten contractors, from Carlisle, Baltimore and Philadelphia, were represented by letter or proxy. N. J. Wetzel, of Carlisle, was the successful bidder, he contracting to erect the building for a little less than $23,000. Its dimensions will be 180x60 feet, with a height of forty feet, and will contain the museum, lecture room and laboratories of the college scientific department. Work is to be begun early in the spring and the building will be ready for occupancy at the beginning of next fall's term.

COMPRESSED WOOD PAVING BLOCKS

The *Kansas City Times* has been interviewing certain experts upon the paving question. A Mr. A. Brisbane, after expressing his convictions that wood paving is the best for that city, and stating that in Buffalo the estimated wear and tear of vehicles and the injury to horses from stone pavements is $1,000,000 annually, gives his plan for compressed wood blocks as follows:

"My plan is to take common wood, cottonwood, basswood, hemlock and elm, cut up the blocks into the proper size while the wood is green, and throw them into boiling linseed oil so that the oil may penetrate them to the depth of about an inch. The hot oil drives out the sap and takes its place, and a coat of oil is thus obtained which makes the wood impervious to the heaviest rains. After this I subject the blocks to a pressure of from 100 to 150 tons, according to the natural hardness of the wood, thus reducing the blocks about one-half in size. This solidifies and compresses them, so that instead of a porous mass I have a hardened block impregnated with oil, which, as regards wear and tear, is as much superior to wood in its natural state as steel is superior to iron, and it will undoubtedly last four or five times as long."

"They can't swell, because they can't suck up moisture. After preparation, they are put together in squares of about three feet in diameter, and are repressed solidly together, so that there may be no joints. They are then laid on the foundation prepared for them and these squares are again pressed closely together by machinery after being put down, some very thick oil being put into the cracks. The object is to leave no joints anywhere through which the water can percolate or evaporate to cause effluvia. On a pavement thus laid, all the water from the rains would be carried into the sewers, and the water would wash along with it all the mud, leaving the pavement entirely clean. Such a pavement would insure us clean streets and exemption from noxious vapors and effluvia arising from decayed matter and filth of all kinds, and these noxious vapors are a great objection to the wood pavements now in use.

"As cottonwood and elm are very cheap, these prepared blocks will cost less than the cedar blocks now being used. Cedar blocks cannot be delivered here for less than $30 per 1,000 feet. Elm and cottonwood, if proper measures were taken, could be obtained for $5, $6 or at most $7, per 1,000 feet. The compressing will double the cost, making, say $12. The oil, and work of compressing will cost from $3 to $4 more, making the total cost from $15 to $18 for blocks, ready for laying.

"I recommend the following process for laying: First, grading the street to its regular grade. The clay soil in Kansas City being naturally hard, can be compressed, and solidified by a heavy roller. On this foundation I would put down a layer of hard burned brick, laid flat, in concrete. The squares of wooden solidified blocks are laid on the brick, and as the pavement can be put down rapidly the operation will be much more satisfactory than the mode by which cedar blocks are laid.

"With well systematized means of preparing and laying this pavement it can be put down for about one-half of the cost of the cedar block pavements, say $1.50 per yard."

"Time, of course, can alone test the wearing qualities of the pavement, but wood solidified, so that no moisture can impregnate it, must last as much longer than ordinary wood as steel rails outlast iron. I understand that in Paris they are now laying on the Champs Elysees just such a pavement, and are guaranteing it to last forty years."

The Knibbs Valve Patent Suits.

It is expected that the old Philadelphia, the first steam fire engine, which was recently taken to Boston as evidence in an important patent suit against that city, will be returned to its owners, the Insurance Patrol, to-day or to-morrow. The suit was by Marcus P. Norton and others, assignees of James Knibbs, of Troy, N. Y., who claimed to hold the original patent for a relief valve, which was extensively used upon its steam fire engines by the City of Boston and elsewhere throughout the country. In the former city alone the royalties claimed by the plaintiffs amounted to $450,000. The part taken in the case by the old engine Philadelphia was interesting. It seems from the statement of those who accompanied her to Boston that she was wanted to prove that the valve, for which the complainants claimed the patent right, had been used on her two or more years before the patent was issued. During the trial the court and jury adjourned to the Boston Commons to witness a practical comparison of the working of the valve of the old engine with that of one of the latest construction. The result, it is said, was amazing, as the old engine, which many feared could not stand the strain, threw a larger stream with two pieces of hose than the other did with one. The valves, it was stated, were shown to be the same, to the satisfaction of the jury, and a verdict for the city of Boston was rendered on Saturday last. Among those who testified with reference to the valve of the Philadelphia was Jacob Neaffie, the builder of the engine and member of the firm of Neaffie & Levy; Joseph L. Parry, the designer; Richard Warren, an engineer of the present Fire Department, and George Kurtz, the original engineer of the Philadelphia, who conducted the practical test at the trial, and who managed the engine over twenty years ago, when her usefulness was exhibited in the City of Boston, near the same spot, and a prize of $600 won.—*Phila. Ledger*, Dec. 25.

SALEM SEWERAGE AND WATER.

In the Common Council, Salem, Mass., last week, the committee on the Mayor's veto message submitted its report with that of Engineer Clarke. The committee's report recommended that the present stone canal should be narrowed to a width of ten feet, and the alteration of the grade to secure a good flow of water, and to continue the canal to North Bridge, and from North Bridge to build a sewer to deep water in Beverly Harbor. It was also recommended that a committee be appointed to petition the Legislature for authority to construct a sewer from North Bridge to deep water. Mr. Clarke's report recommended the laying of a 16-inch iron pipe sewer on the north side of the canal from Frye's Mills to Dean street, and a 40-inch iron pipe sewer on the north side of the canal between the same points, both to enter a round wooden sewer built of plank, three inches by eight, tongued and grooved, and to be five feet in diameter. This sewer is to be placed upon piles ten feet apart. This sewer would be continued on the south side of the present basin under the bridge and to enter an iron pipe sewer at the terminus extending to deep water. The pipe would be covered with tar, and would be durable for years. The report expressed the opinion that such a sewer could be constructed for $151,195, exclusive of land damages. There was a supplemental report in which the engineer thought that there was no need of filling the basin, and that dredging would sweeten its waters. Mr. Ingalls said that the committee was greatly disappointed in the report. The report was accepted, and an order adopted for the appointment of the committee.

The Salem Water Board presented its fifteenth annual report. The total appropriation for the Water Department was $32,486.55. There has been expended for construction, $6,512.47; for maintenance, $25,761.32; making a total of $32,273.79. Net receipts from water rates were $43,253.37, and from other sources $508.55. There was received from Beverly in 1883, $11,000, making the total receipts $55,761.92. The amount allowed for discounts was $4,521.50. The office expenses have been $269.66. The cost of construction of the water works to Dec. 1, 1882, was $1,406,684.07; added in 1883, $6,512.47; making the total cost to Dec. 1, 1883, $1,413,160.54. The pumping service has cost $12,557.58.

Condition of the Suez Canal.

ALEXANDRIA, NOV. 29.—I have just returned from a visit to Port Said and the Suez Canal. I was much struck with the improved management of the traffic and the civility of the officials. There has been no serious block for months past, partly owing to the moderate traffic, partly because the company intend to bear the expense of ships getting on shore when in charge of the pilots, instead of the system hitherto adopted of imposing pilots at an exorbitant scale of charges and saddling the shipowners with immoderate sums for damages caused when those pilots were handling the steamers. The general opinion here among persons of experience in the working of the canal is in favor of widening and deepening it rather than of making a second one parallel. It is considered here that the existing monopoly must undergo more modifications than M. de Lesseps seems disposed to order. No material widening of the present canal or construction of a second is possible without a fresh concession, and the Egyptian Government is determined to protect the interests of Egypt, which were wholly ignored in the first concession. M. de Lesseps cannot move without the assistance of England, and the British shipowners are masters of the situation if no hasty decision be sanctioned.

A LARGE FAMILY.

PARIS, NOV. 29.—Meeting M. de Lesseps with his eight children, whom he calls his light cavalry, riding home from Suresnes, he asked me to join him and have a chat. While the conversation went on the young people lay round on a big mat listening, the girls in habits and the boys in equestrian suits. Occasionally one or another started up to whisper some observation suggested by what he heard, or to ask for an elucidation on some point he did not well understand. M. de Lesseps began by saying that he feared the object of his visit to England was misunderstood, and that telegraphic agencies and journalists certainly misrepresented it. He did not go to ask favors, or offer compromises, but to see those to whom he lets the right of passage through the canal in the character of a reasonable and accommodating landlord, ask them in what manner he could be agreeable to them, and hear what they had to say in answer. This was because the live-and-let-live principle is the best in great affairs. At the next board meeting he would inform his colleagues of what he heard in England.—Correspondence *Chicago Tribune*.

PATTI'S PRIVATE CAR.

Patti's private palace car built by the Mann Boudoir Car Company, at an expense of $40,000, was on exhibition at the Grand Central Depot December 21st. Its name is "Adelina Patti." In the centre of the car is a saloon about fourteen feet long and nine broad. The roof is panelled with embossed leather, colored with two shades of gold leaf. In the sides of the saloon are plate glass windows sixty inches long and forty-six inches high. On either side of the windows are bevelled glass mirrors, set in the side of the car. Patti's private room is at one end of the saloon, and Nicolini's at the other. The woodwork in the saloon is amaranth wood, and the painted panellings are by the artist Rosignoli. The apartment contains an upright piano, two revolving chairs, a table and a sofa. Patti's room is 10 ft. long and 6½ ft. wide. In one corner is a tiny bathroom, just large enough for a French, or half-length, bath tub. Hot or cold water is supplied. Patti has three windows in her room, and under the middle window a writing desk three feet high, covered with green baize, and containing four drawers. Above the copper nickel-plated wash basin, in a corner of the room, a bevelled glass mirror is set into the wall. The ceiling is of old gold, embossed leather. The bed is upholstered in silver blue tinted tapestry, dotted with little roses, and this upholstering is carried around the walls and between the windows. The wood used in this room is satinwood.

Nicolini's room is like Patti's, except that the wood is amaranth and the upholstering is of dark gold threaded tapestry. Nicolini's valet has a room next to his, and Patti's two maids a room next to her room. At Nicolini's end of the car is a buffet, in which will be an ice chest, hot water boiler, spirit stove, wine closet, silver, and table linen. There are no arrangements for preparing anything more substantial than an egg or tea and coffee.

The manufacturer says that the car is a counterpart of one made by him some time ago for the Czar of Russia, to be used by the Grand Duke Michel.

THE ATCHAFALAYA BRIDGE.

NEW ORLEANS, Dec. 27.—The first train crossed the Atchafalaya bridge on the Texas Pacific Railroad yesterday. The structure is now completed and trains are passing over it regularly. Work was commenced on the bridge, which is situated 130 miles west of this city, in September, 1881. The high water caused a suspension of labor during the winter months, and much trouble was experienced on account of rapid changes taking place, the river getting deeper and wider. Since June, 1883, a day and night force have been constantly employed. The bridge is 1,045 feet long, and consists of two fixed spans, each 253 feet long, one span 163 feet long, a draw span 303 feet long, ane 73 feet of trestle approaches. The spans are of iron, of the Pratt pattern, and the piers are wrought and cast iron cylinders, filled with concrete. The foundations are in no instance less than 120 feet below high water, and from 70 to 115 feet below the ground. The cost of the structure was about $500,000. The completion of the bridge is of the greatest importance to the Texas Pacific Railroad, since the large amount of freight heretofore turned over to the Morgan Road at Cheneyville, will hereafter come directly through, and the delays to both passenger and freight trains, incidental to the former transfer at Atchafalaya, will no longer exist.

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American Society of Civil Engineers.

The thirty-first Annual Meeting of the Society will be held in New York, on Wednesday, January 16, 1884, at 10 a. m.

The Annual Reports will be presented, officers for the ensuing year elected, time and place for the next Annual Convention considered, reports of Standing Committees presented, and other business transacted.

It is expected that the business of the meeting will be transacted during the first day; a lunch will be served at the Society House. Arrangements for the evening of Wednesday, January 16, and for the day and evening of Thursday, January 17, will be perfected by a Committee, and will include visits to points of interest.

The New Croton Aqueduct Line.

The *Times* of Dec. 26 illustrates by a map the latest project of Chief Engineer Church for conveying water to New York from the proposed reservoir to be made by the Great Dam at Quaker Bridge.

Instead of carrying the aqueduct from Quaker Bridge Dam, down the Hudson, he now proposes to commence the aqueduct at the present Croton Dam, and connect with the old line at a point opposite Scarborough on the Hudson. This new plan lengthens the aqueduct by two miles, but possesses the advantage of isolating at will, the waters of the Croton Dam from the new reservoir; that is, after the new storage basin has been drawn down 34 feet. As the new supply for New York will be stored water, it might be desirable, after the experience of Boston and other cities, to draw off the water to rid it of any contaminating material. With the aqueduct at Quaker Bridge the daily supply would have to come from the Croton Lake and thus pass through the bad water of the reservoir; with the aqueduct at the junction of the two systems, the Croton water could be delivered undefiled by any contact with the lower level.

It seems that the Aqueduct Commission recommends the Quaker Bridge Dam as a starting point for the aqueduct, and Engineer Church prefers the Croton Lake site. As the public is hardly yet familiar with all the controlling details of the vast scheme; we, with the public, cannot decide upon the respective merits of the above two plans. The Church line while it adds two miles of aqueduct, certainly has some apparent advantages, but we are not made acquainted with the details of the Commission's plans which may provide for similar contingencies.

We confess that we do not understand the motives which may lie at the bottom of this clashing of authorities; nor why a Commission should have one plan and its Engineer another. We have no authority in fact except the statement quoted, that the new plan is really the one advocated by Mr. Church.

There seems to be unnecessary delay somewhere in the final adoption of plans and the commencement of a much needed work; and while we do not advocate unwise haste, we think that sufficient time has elapsed to thoroughly investigate all the engineering details of the scheme. The difference of opinions referred to above only still further defers the wished-for end in view, the protection of New York City; and having almost lost faith in Commissions, we must trust to Providence that no great calamity will cause us to bitterly regret the slowness of action which characterizes the present Commission.

Erection Notes, Niagara Cantilever Bridge.

The Niagara Cantilever being the first bridge of its class actually erected in this country, we have taken some trouble to obtain the following notes and dates, relating to this important portion of the work done.

As mentioned before by us, the Central Bridge Co. of Buffalo, N. Y., were the builders of the bridge and the contractors for its erection, including the masonry piers, and their foundations.

The contract with Central Co., was signed	April 11, 1883
Excavation commenced	April 15, 1883
Beton foundation commenced	June 6, 1883
" " finished	June 26, 1883
First stone set in pier	June 26, 1883
River pier finished	Sept. 3, 1883
Anchorage piers commenced	Aug. 27, 1883
" " finished	Oct. 1, 1883
Steel Towers finished	Sept. 19, 1883
Commenced erecting shore-arms of Cantilever	Sept. 28, 1883
Commenced erecting river-arms of Cantilever	Oct. 29, 1883
Made center connection of lower chord	Nov. 21, 1883
Finished the center trusses	Nov. 22, 1883
Bridge opened to travel	Dec. 20, 1883

The total weight of material handled, exclusive of false works under shore-arms, was 7,144,000 pounds, all of which had to be handled three times before it was in position, with an average haul from point of unloading to bridge, of one-half mile.

The wooden false works under the shore-arms were designed by Mr. S. V. Ryland, the Superintendent of Erection; were very simple, effective, and economical. No timber in it was more than 20 ft. long; all the members were framed square on the end and united by stout iron dowels; there was not a tenon or mortise in the structure. The purpose was to keep the timber in a merchantable condition, and in this Mr. Ryland succeeded admirably.

We have already given the names of Mr. C. C. Schneider, Chief Engineer of the Niagara Bridge Co., and designer of the bridge, and that of Mr. E. Hayes, the Engineer of the Central Bridge Co., and can not refrain from adding that of Mr. S. V. Ryland, who has so ably superintended the erection of the trusses. Mr. R. is no novice at this business, having for years been connected with the firm of Kellogg & Maurice, well-known bridge builders. He erected the Smithfield Street bridge at Pittsburg, designed by Gustav Lindenthal, C. E.; put up five years ago a combination Cantilever truss of 160 ft. span over the Snake river, at Eagle Pass, Idaho; and executed some of the most difficult work of this description on the line of the N. Y. W. S. & B. R. R.

In this connection we might say, that after the Frazer River Bridge, also designed by Mr. Schneider, the next Cantilever bridge will probably be the St. John's bridge, in New Brunswick, Job Abbott, Engineer, Montreal. This bridge will rest upon masonry piers. The Cantilevers are of unequal lengths, one is 190 ft. 8 in., the other 143 ft. 1 in.; the shore and river arms in each case being alike. The centre span will be 143 ft. 1 in., making the total river span from shore pier to shore pier, 476 ft. 10 in. In design, the St. John's is the reverse of the Niagara Cantilever, the bottom chord being the horizontal member and the one sustaining the floor system, it is a through bridge in fact, instead of a deck bridge.

WATER WORKS' STATISTICS.

The statistical tables of water works which we published in May last, have met with universal approval. The pamphlet is sought for by every company and committee which is undertaking new water works, and has become a standard text book and book of reference among the managers of works and the manufacturers of and dealers in water-works supplies. The demand for the book is steady and shows that the laborious undertaking of Mr. Croes has not been in vain. The publication of the historical and descriptive sketches of water works has been continued in ENGINEERING NEWS during the year, and 131 towns have been added to the list. This number ought to have been twice as great, but there are still a number of towns which have not responded to the requests for information, notwithstanding the fact that every superintendent has received a copy of Mr. Croes' Tables and a blank asking him to send in return the facts relating to his works.

A special effort will be made to get this information early in 1884, for the publication of the completed "History and Statistics of American Water Works," cannot be delayed indefinitely on account of the neglect of a limited number of officers of works to send descriptions of their works.

The thoroughness and completeness, and convenient arrangement of Mr. Croes' work appears conspicuously when it is compared with the partial statements of certain State Commissions regarding water supplies in their Annual Reports.

The Report of the Geological Survey of New Jersey, and of the State Board of Health of Massachusetts for 1882-3, contain statistical information concerning the water works in those States, but the data are inconveniently arranged and so incomplete in themselves, and in many cases incorrect, that the reports are of little value to any one, and least of all to busy men who want to have their facts arranged for them in such a manner that a glance will show their relation to each other as well as their absolute value. These reports too have only a limited issue and circulation, whereas our publications go over the whole country, and particularly to the persons to whom the information is useful. The fact that the local boards are making efforts to collect statistics of water supply, shows that the subject has become one of general interest and inspires us to renewed exertions to keep ENGINEERING NEWS in the front rank in this matter, in the future, as it has been in the past. More water works have been built in 1883 than in any previous year. We will publish early in January as complete a list as is attainable of the works completed during the past year and of those projected and in progress, and we trust that every one of our subscribers will send us all the reports, projects, statistics and data relating to past, present and future water works construction that he can lay his hands on.

AT a meeting of the council of the Amer. Institute of Mining Engineers held in New York, December 11th, 1883, the Secretary, T. M. DROWN, informed the council that he was compelled, on account of business engagements, to resign the secretaryship of the Institute. The Council accepted the resignation, to take effect January 1st, 1884, and appointed DR. RAYMOND, New York, to the secretaryship for the unexpired term. All communications to the Institute should therefore be addressed, after January 1st, to DR. R. W. RAYMOND, Secretary, Lock Box, 223, New York.

ASPHALTIC MASONRY.

In the ENGINEERING NEWS of November 24th, we briefly noticed this subject in our report of the proceedings of the Society of Civil Engineers of Paris, at their meeting of October 6th. From a more complete report of M. Leon Malo's paper, in the *Moniteur Industriel* of November 22d, we obtain this further data.

M. Malo first explained that by a very common error, it was generally supposed that asphalt (the mastic asphalt used in the construction of pavements) would always soften and lose its shape under the influence of climatic heat. This is a mistake that should be at once corrected. If the pavements do soften, it is simply because the asphalt is applied in thin layers. When mastic asphalt is used in masses of a certain volume, some inches for example, it becomes absolutely insensible to the action of temperature up to 40° or 45° C.

From actual experiments M. Malo concludes that asphalt is well calculated as a cement for masonry.

After several unsuccessful attempts he used a mass of asphaltic masonry for the foundation of a fifty-horse power steam engine. This foundation has now been standing for five years, and has never shown any signs of weakness. The elasticity of the asphalt, which is very trifling however, serves to take up all the vibrations communicated to the mass by the movement of the engine.

Since this first trial, M. Malo has built in asphaltic masonry several other foundations, among them a mass 13½ ft. high to support a crusher, and always obtained the same solidity.

M. Malo then gave some directions as to points to be looked after, and the methods of making the asphalt cement.

Asphalt is a pure carbonate of lime impregnated, by a geological phenomenon still imperfectly explained, with a black and viscid matter commonly called bitumen.

This calcareous bitumen, or asphalt, is mechanically reduced to a fine powder, then heated in a bath of free bitumen (7 or 8 of free bitumen to 100 of asphalt) up to 225° or 230° C. We thus obtain a paste called mastic asphalt, which poured into cakes, remelted and mixed with gravel, is used in the construction of pavements.

It is this mastic asphalt which is used as a cement, mixed with sharp sand and introduced into the joints of the masonry. It is, in the first case, a bituminous beton; in the second place, it is masonry pugged in asphalt, and the adherence of this asphaltic cement is such, that the stone will break rather than separate from the cement.

The Dry Goods Men of New York Want Water.

Some of the most prominent and wealthy merchants and insurance men of New York appeared before the Sinking Fund Commissioners on December 21, and argued for a better and more speedy protection against fire in what is known as the dry-goods district. They favored the Ramapo Valley plan of water supply as being the best suited to them.

A representative of H. B. Claflin & Co., said that the merchandise and buildings in the district above named was valued at $500,000,000 and at least $150,000,000 of this property was uninsured and not insurable. The new aqueduct would not afford the protection required. He understood that a company had been organized with sufficient capital to deliver at the northern boundary of the city 50,000,000 gallons of water a day from the Ramapo Valley and they asked no money from the city to build it.

George T. Hope, President of the Continental Fire Insurance Co., said the Croton pressure was daily growing less; 75 ft. was the highest point that could be reached, as testified to by the fire department engineers.

After considerable testimony the matter was laid over until the Commissioners could obtain further information concerning the company proposing to do the work.

THE CAR-WHEEL OF THE FUTURE.

The *Railroad Gazette*, in an editorial comment upon the late meeting of the N. E. Railroad Club, at Boston, and the subject of their discussion which heads this article, proves pretty conclusively that the "car-wheel of the present" is not up to the requirement of the times. But whether the numerous failures of cast-iron wheels are to be ascribed to the competition among the manufacturers or to faulty design is left as a matter of conjecture by the users of the wheels, who decline to make public their statistics of breakage even when such are kept.

The use of steel-tired wheels under passenger cars is yearly increased by the liability of the companies to pecuniary damages as the result of the failure of the cast-iron wheel; and the editor of the *Gazette* foretells the entire abandonment of the latter for passenger service unless their quality can be in some way improved.

In Europe, where wrought-iron and wood are used exclusively for wheel centres, it is the steel tires that give trouble by breaking; and the engineers of that section of the world are devoting their attention to appliances to prevent accidents *in case tires break*. In England the wooden Mansell wheel centre has been abandoned on one prominent railroad because the tires will turn in spite of all precautions.

After showing the vagaries of theorists who dilate upon the "deadening of blows" and "absorption of vibrations," etc., as the requisites of a perfect car-wheel, the *Gazette* gives the following summation of these requisites as it views them:

1. It must be reasonably safe against breakage. No wheel is or can be entirely so.
2. If it has a tire, it must be secured to the wheel so that the tire if broken into two halves, could still be run safely.
3. The tire must be prevented from turning by the action of the brakes in case it should be heated by them.

No wheel which does not fulfill these conditions is at all likely to be the wheel of the future. Of course, of two or more kinds of wheels, which fulfill these conditions, that which will perform a given amount of service at the lowest cost will be preferred.

KANSAS CITY CONTRACTORS OBJECT.

The Kansas City *Daily Times* of Dec. 12 contains the following item:

"A great howl has been raised by certain papers of this city because of the fact that there has been inserted in a New York engineering journal advertisements inviting proposals for the paving of Union avenue and Mulberry streets," said City Engineer Knight yesterday. "In the first place, 'unbalanced bids' are held up as an awful consequence of allowing New York contractors to get a finger into the Kansas City pie. We are all familiar with 'unbalanced bids,' and a special provision is made that all such bids shall not be considered. There will be about 12,000 yards of paving on Mulberry street and Union avenue, and my idea was to advertise in such a manner that heavy contractors might have their attention attracted. By advertising in the Chicago newspapers we had three of the biggest contractors in Chicago bidding on the wood pavements here last summer. One of them got the job on Delaware street, and I doubt very much whether a single person can be found in Kansas City who is dissatisfied with that result."

As publishers of the New York engineering journal referred to, we believe that the position taken by City Engineer Knight is the correct one. The rule of the matter-of-fact present is to get the best work done for the least money, and this rule applies to cities as well as to individuals. If a foreign contractor by reason of wide experience, better plant and greater capital can do more satisfactory work than a local party the latter must suffer; that is unless the authorities letting the contracts are guided by some other than the principles of true economy and the desire to do justice to the people they represent. Modern contractors, at least the enterprising and successful members of the guild, belong to no one locality; they follow work, be it near at hand or beyond the seas,

THE LOUISIANA LEVEES.

The *Times-Democrat* reports the proceedings of the Levee Convention, held at Baton Rouge some time ago, to consider the damage to the State from the overflow of the Mississippi; the results of their calculations are given in the following summary of losses last year upon the chief product of Louisiana:

Cane	$5,122,327	Corn	$1,102,497
Rice	106,858	Other losses	2,800,655
Cotton	2,959,833		
Total			$12,753,210

Nine parishes had as yet made no report, and it was estimated that through them the loss would be raised to $18,000,000. On the strength of these calculations the *Times-Democrat* makes some interesting deductions:

"In a single year enough property was swept out of existence in Louisiana to have placed its levees in such a condition that crevasses and inundations would be impossible.

"In these sixteen parishes 606,674 acres of arable land were inundated, and it is calculated that the building of levees would reclaim 1,857,700 acres more of as fine land as any in the world, but which is now uncultivable because it is annually under water.

"The net result of a good system of levees in Louisiana means the prevention of heavy losses from overflows—$18,000,000 in a single year—and the redemption of 3,000,000 acres of land, worth from $10 to $50 an acre. The money value of these levees would reach nearly $100,000,000, six times the cost of the most perfect levee system imaginable. These figures cannot but have some influence on Congress."

After this comparative exhibit of "profit and loss," the most sensible thing for the people of Louisiana to do would be to build the levees themselves instead of annually pleading with Congress for an appropriation. The residents of the State are the people most directly interested, and it seems to us that when a saving of $18,000,000 per year can be effected by an outlay of about $16,000,000, the scheme should contain sufficient merit to attract private capital; providing that the State does its duty and insures the investor against loss by any repudiation financeering.

The Manufacture of Portland Cement at Stettin.

From the Report of the Chamber of Commerce of Stettin (Germany), as published in the *Topfer und Ziegler Zeitung*, we make the following extracts concerning the manufacture of Portland Cement at that place:

In 1881 the exportation of cement by sea was 26,941 tons; in 1882 it was 24,461 tons, of which 6,329 tons went to German ports, 10,451 to Denmark, 792 to Norway, 834 to Sweden, 3,352 to Russia, 644 to Holland, 529 to England, 1,242 to America, and 207 to Brazil.

The actual manufacture at Stettin amounted in 1882 to 32,500 tons, as against 26,500 tons in 1881.

The "Star" Portland Cement (Stern) Company has made sales of 204,000 barrels in the last year; these works employ 600 men. The duty of one franc twenty-five cent. per 100 kilos, put upon foreign cement by Russia and Austria, has rendered export to those countries almost impossible.

The "Pomeranian Industrial Union makers of Portland Cement at Lelbin, sold 208,000 barrels of cement, of 396 lbs. each, in the last year. They employ from 600 to 700 workmen.

According to these figures, the total output of the three manufactories in the neighborhood of Stettin, was about 106,000 tons, of which about 18,000 has been exported.

IN the three days following M. DE LESSEPS' return to Paris from London he attended the Italian opera, three dinner parties, and went out daily with eight of his ten children. Besides, he got through all the office work that accumulated in his absence, was interviewed by journalists from all parts of the world, gave cues to friendly editors, checked housekeeper's accounts, and embraced a poetess who called on him to read a poem in 400 lines of which he is the hero.

THE INDUSTRIAL OUTLOOK.

The reductions in wages throughout the United States are attracting the general attention of manufacturers, jobbers, business men, contractors and projectors of heavy lines of work. It has been considered by employers, for two or three years past, that the rate of wages paid was out of proportion to the amount of business done and the resulting profits. The desire to reduce wages has existed for a long time but it is only within a month or two past that the opportunity of doing so has presented itself. The reduction, general as it is, and necessary as it may have been, will not probably increase the volume of work materially, but if it has any effect it will be to equalize profits somewhat, and to give the employers of labor a more reasonable share thereof than they have enjoyed for the past year or so. Active competition in the industries has depressed profits to a very low limits and the result is shown in increasing failures in nearly every branch of trade and manufacture. The manufacturing intrests are boldly facing the necessity for restriction of output and are rapidly harmonizing production with demand. The wage-workers have not been called upon to bear their share of the depression until lately. The reduction in wages ranges from 10 per cent. to 20 per cent. The steel-rail mills are reducing from 10 per cent. to 15 per cent. The textile manufacturers are in many cases reducing 20 per cent. In a number of shop industries the reduction averages 12½ per cent. For a year past, employers have felt that the rate of wages demanded a re-adjustment but in most directions were unable to effect it because of the very general organization which has been built up among the workers and which extends its influence not only to those in the organization, but to many times the number of unorganized workers. Hence, foreign workmen have been induced, in a good many instances, under stipulation of attractive wages, to emigrate to this country, and this departure on the part of manufacturers has developed a strong opposition among the organized laborers to what they term "imported pauper labor." Congress will be ask to legislate against this form of emigration.

The labor question and its solution will exercise a very important influence upon the industries and upon the inauguration of new enterprises next year. The fact that the wage-workers of this country have formed a more or less effective natural organization gives rise to apprehension that strikes will be inaugurated in the spring, that enterprise will be frightened and that much less work will be undertaken than if the workers were contented and were not in a good shape to enforce their wishes. It can be safely said that apprehensions on this score are largely groundless; that with all their organization, a conservative course will be adopted and adhered to; that general strikes will not take place; that arbitration and conciliation will avert much trouble and that enterprise will be left free to undertake what it pleases. The greatest danger is in the building trade but this danger is due to the fact of the high cost of living in cities. It is here that trade-unionism is strongest and it is stronger in New York than in any other city on the American Continent. The incentive to organization is due to two influence,—one positive and one negative. The first, the highest price of living referred to,—the second, the influx of foreign workmen whose competition is felt more in these cities than in the interior, and hence it is, that combinations hold together better where the incentive is so direct and effective. Throughout the great interior, other and more favorable conditions act to obstruct such organization and to give competition fuller play. The cost of living is less; the industrial centres are surrounded by material for cheap subsistence and there is a constant tendency among the rural population to enter the better paid avenues of employment in the industries. Besides all these influences, the rapid increase in the agricultural area and the decline in cost of transportation and cheapening subsistence at all points except where prices, as on the sea coast, are determined by export traffic.

At any other time than the present it would not be worth while to advert to the labor question but it is proper to do so now, in order that engineers, contractors, capitalists and investors, who are contemplating active opertions next season, may know the conditions and possibilities and probabilities. Delegations of Swedish and French workmen are now in this country to ascertain the actual industrial condition and also the relative condition of the workmen in these countries and United States. Their desire is to check emigration. The condition of the British and Continental workman is steadily improving as is shown on good authority. There is a healthful tendency to an equalization of conditions. Labor combination may for a time help to maintain an artificial distinction but competition can be relied upon to protect employers' interests.

In addition to all these influences, the demand for labor next year will not be in proportion to the increase of the past three years. The industries must take a breathing spell; must harmonize themselves; must become symmetrical. In short, the industries need organization, and they will receive it during the coming year, and that, chiefly through the power and force of the competitive influence at work. We are laying the foundation for a broader and deeper industrial activity, but the coming twelve months will not inaugerate it. Each industry has been climbing ahead on its own hook. Each bears a certain relationship to all others. That relationship has not been studied carefully. Every ton of wheat calls for a ton of steel, figuratively speaking.

The diversification of our industries will prevent any serious over-production from clogging all the channels of trade. The iron furnaces of the South are widening the foundations of the iron trade. Southern cotton mills are putting the textile interests upon a different basis than they would ever have reached, had it not been for the new departure in the way of Southern industrial enterprise. The spread of machine shops in the South and West, along with similar influences and tendencies is breaking down sectionalism in trade interests, and strengthening the industrial system, and at the same time multiplying the market for all kind of products. Alabama, instead of depending upon Pennsylvania for her iron, makes her own. Georgia instead of depending upon Ohio for her machines is preparing to build them herself. The South and West instead of sending to New England for cheap textile goods, have their own manufactories in that line. This diversification is more important in its ultimate effects than is apparent. It is building up industrial communities where the cost of production is the cheapest and thereby creating the best possible demand for the production of all other sections. Cotton culture is no longer monopolizing the energy of the South. Out of all these multifarious developments and activities grow demands for more railroad mileage, more machinery, more ships, more bridges, more brains and talent and energy. The abundant capital awaiting employment will have enough to do in the near future. The army of labor will never be in antagonism to it or to the country's prosperity. The cost of production and transportation is declining year by year and the share of the laborer is increasing in like proportion while the opportunities for the employment of labor and capital are widening out.

THE proposed improvement of the East River water front if carried out will cost $10,000,000, according to the report of the Sinking Fund Commissioners.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E. : M. INST. C. E.

(Continued from page 605)

DLXXX.—PARSONS, KAN.

Parsons, Kan., in lat. 37° 20′ N. long. 95° 20′ W. is on rolling prairie land on Big Labette Creek. It was settled and incorporated as a city in 1871. Water-works were built in 1883 by a private company after plans of P. B. Perkins and under superintendence of Charles W. Hill, taking the supply from Big Labette Creek, which rises about 20 miles north of the city.

A stone dam, 14 ft. high, 12 ft. wide at the base on the bed rock and 7 ft. wide at top, built of limestone, laid in Fort Scott hydraulic cement, is built across the stream. A filter gallery is constructed above the dam in the bed of the stream, by an excavation 7 ft. deep, 10 ft. wide and 50 ft. long, covered with timber laid ¾ in. apart, on which is laid a bed of stone and gravel 4 ft. thick. The water passes from this to two settling reservoirs, each holding 2,500,000 gallons, constructed in excavation, with the inner slopes paved with 10 inches of stone, grouted and plastered with cement. The water is pumped by a Smith & Vaile steam pump of 16½ inch steam and 10 inch water cylinder of 24 inch stroke, lifting 147 ft. to a tank 18 ft. diameter and 24 feet deep, on a masonry tower 80 ft high. This is used for the ordinary pressure, and in case of fire the pumps deliver directly into the mains. Distribution is by 7 miles of cast-iron pipe of from 12 to 4 in. diameter, with 50 fire hydrants, 34 gates and 400 taps. The city pays $3000 per year for 50 hydrants and $50 for each additional one. Service pipes are of wrought iron.

The population in 1880 was 4,187 and is now said to be about 6,000. The capital stock of the company is $100,000. The bonded debt is $50,000 at 6 per cent. interest, which is paid by the city to the bondholders. The cost of the works has been $85,000.

A. H. McCormick is the President and Superintendent, T. H. Cunningham, Secretary, and Hon. A. H. Matthewson, Treasurer.

DLXXXI.—BUENA VISTA, COL.

Buena Vista, Colorado, in lat. 38° 51′ N. long 106° 7′ W. is on the Arkansas river, 35 miles below Leadville. It was settled in 1879.

Water-works were built for the town in 1883, by the Colorado Machinery Co., Denver, after plans of A. C. Libby, C. E. The supply is taken from Cottonwood Creek, two miles from and 150 ft. above the town. Distribution is by three miles of wrought iron lap-welded pipe with Converse joint. The pipes are from 10 to 4 in. diameter and there are 10 fire hydrants. The works have just gone into operation. The cost has been $30,000.

The population is stated to be 2,500. The number of taps and the names of the officers are not given.

A Liquid Serving to Determine the Density of Mineral Substances.

A German, Mr. C. Rohrback, proposes a method of separating mineral substances according to their density, and at the same time indicating the density itself.

He employs for this, a liquid the density of which is 3.57, and prepared in the following manner: He takes 100 parts of ioduret of borium, and about 130 parts of red ioduret of mercury. This he mixes with twenty cubic *centimetres* of distilled water, and heats the mixture to 150° or 200° (C.) by means of an oil bath, concentrating until a topaz will float upon the surface of the liquid. It is left stand some days, decanted and filtered.

The liquid obtained is yellow, and boils at 145° C.

A great number of mineral substances can be separated by this process.—*Moniteur Industriel.*

PERSONAL.

Chief-Engineer Charles H. LORING will succeed COM. SHOCK as chief of the Bureau of Steam Engineering.

THE city council of Wilmington Del., have elected DAVID H. COLE, Chief Engineer of the water works of that city.

THE chief engineer of the Northern Pacific has moved his headquarters from Brainerd to the G. O. B. in St. Paul.

FRANK P. DAVIS, recently on the Canadian Pacific Railroad, has returned to Michigan, and has taken the position of Chief Engineer of the Jackson and Cincinnati railroad, with headquarters at Jackson, Mich.

JOHN C. WYMAN and H. Watkins, of New York, and Frank H. Truesdell of the District of Columbia, were appointed by the President, on Dec. 18, a Commission to examine the Northern Pacific Railroad in Washington Territory.

IT is announced, in the last number of the *Railroad Gazette*, that Mr. M. N. FORNEY will retire from the editorial management and the ownership of that paper on the 1st of January. Mr. FORNEY first became connected with the *Gazette* in 1870, and retires now for rest and to recuperate his health.

MAJOR H. M. DRANE is Chief of Construction of the Plant Investment Company. He is one of the oldest and most successful railroad men in Florida. When he was a young man he was a large contractor and assisted in building the Transit Railroad from Fernandina to Cedar Key.

AT Leesburg, Fla., on the 18th, MAJOR W. P. COUPER, Chief Engineer of the Florida Southern Railroad, was stabbed—probably fatally—by Mr. BIRCHFIELD, a tie contractor. MAJOR COUPER'S side was so laid open by the gash from BIRCHFIELD'S knife, that the lobe of one of his lungs protruded. There is scarcely a hope of the Major's recovery.

SAUGERTIES, N. Y. Dec. 20.—The marriage of Miss Emma Loretta Schoonmaker and Mr. George Oliver Tenney took place in the Reform Church this afternoon. The bride is the youngest daughter of the Hon. P. P. Schoonmaker and a sister of the Countess Krocko, of Lubin, Germany. The groom is a native of Cambridge, Mass., and a civil engineer in the employ of the West Shore road.

P. S. SIMPSON, of New York, contractor for the building of the New Castle & Northern Railway is at law in the Pittsburg courts with Frank Hennings and Chas. N. Calhoun, stockholders in the above road which must be completed in 60 days to obtain a concession of $300000 from the Erie R. R. and the defendents withhold the plans from Simpson unless he guarantees them a share in the profits.

OSGOOD & MACNAUGHTON, the well-known builders of dredging and excavating machinery of Albany, N. Y., have transferred all their patterns, patents, assets, and good-will to the Osgood Dredge Company. This move is really a re-organization under a new name and with new patents and increased facilities for turning out the special class of work for which they have already a well earned reputation. RALPH R. OSGOOD is President of the new company, JAMES MACNAUGHTON is Vice-Prest., and JOHN K. HOWE is Secretary and Treasurer.

IT is stated that last summer HENRY N. POOR, compiler of the "Railway Manual," became satisfied that the North Pacific Railroad Company was concealing a large floating indebtedness, and that stock must suffer a heavy decline. He formed a syndicate and sold stock short to the amount, it is said, of 40,000 shares. The stock was above 80, and went below 40. The profits were in the neighborhood of $2,000,000. When the facts came out, Poor's estimate of indebtedness was found to have been almost absolutely correct.

MR. HARRISON GRAY OTIS MACOMBER, a well-known contractor and builder, died on Thursday, 20th, in Providence, R. I. He came from old Puritan stock, being a direct descendant of the Rouncevilles, who came over in the Mayflower, and was born in Freetown in 1819, where his ancestors had lived for nearly 200 years. When a young man he learned the trade of mason, and, together with his father, went to Cuba, where he engaged in the construction of large sugar houses. Upon his return to the United States he went to Rhode Island, and speedily became known as a skillful and painstaking workman. He was particularly noted for the erection of large buildings, among which the City Hall, the new High School, the Cathedral, and other edifices in Providence bear witness to his skill. In 1869 he was a member of the House of Representatives, and had held other offices in the public service.

MR. CHARLES PAINE has resigned his position as General Manager of the New York, West Shore & Buffalo R. R. on account of ill health. He sailed from New York, Dec. 22, and purposes making a tour of Europe, with the expectation that rest and travel will restore his health. Mr. PAINE went to the West Shore road from the Lake Shore & Michigan Southern, where he was for a number of years Gen. Superintendent. Upon him has developed the labor of organizing the operating department of the new road and putting the machinery into working condition. In his resignation the West Shore suffers a serious loss, for his place cannot easily be filled.

THE Washington *Star* says; "The wife and daughters of Prof. Newcomb, of the Naval Observatory, will not return from abroad for the next two years. The Professor's eldest daughter, Miss Anita, has a remarkable talent for mathematics and can compute eclipses with almost as great facility and accuracy as her father. Miss Newcomb is now studying music and the languages. Upon first going abroad she passed one term at Newnham College, Cambridge, and later joined her father in his travels through Italy, Germany, and France, the rest of the family meanwhile remaining at Neufchatel. Last Christmas season Miss Newcomb passed in Kent as guest in the family of Sir William Herschel. The family are at present in Geneva, where the two younger daughters are at school. The rest afforded by her continental trip was greatly needed by Mrs. Newcomb, whose duties as hostess to her husband's many guests while keeping house in Washington were of no light order, their home being the rendezvous of scientific men from all parts of the Union."

THE WESTERN SOCIETY OF CIVIL ENGINEERS have moved from their old quarters in the Honore building, Chicago, to a large room in the American Express building on Monroe street. The new quarters are comfortably furnished, and are kept open to members at all hours. The society, with a view to increasing its usefulness, some time ago arranged to have investigatory and expository work done by "topical committees." These committees are constituted as follows: Surveys and Topography, S. S. Greeley and G. A. M. Liljencrantz; Materials, Charles Fitz Simons and O. B. Green; Construction, W. Sooy Smith and S. G. Artingstall; Bridges, Horace E. Horton and F. B. Sheldon; Transportation, Railroads, Canals, Streets, etc., L. M. Johnson and A. W. Wright; River and Harbor Improvements, G. A. M. Liljencrantz and R. A. Brown; Water Supply, Sewerage, etc., John A. Cole and Benezette Williams; Fuel, Heat for Industrial Purposes, John Zellweger and W. S. Bates; Lighting, Heating and Ventilating, Benezette Williams and W. S. MacHarg: Mining, M. A. A. Myendorff and C. J. Roney; Tools and Machinery, W. H. Lotz and D. C. Cregier; Jurisprudence of Surveys and Engineering, S. S. Greeley and J. M. Bourne.

BUILDING NOTES.

COMPOSITION OF DIFFERENT AMALGAMS.—Arrington amalgam: silver, 40 per cent; tin, 60 per cent. Diamond amalgam: silver, 31'76; tin, 66'74; gold, 1'50. Hood's amalgam: silver, 34'64; tin, 60'37; gold, 2'70; iron 2'90. Johnsohn & Lund's amalgam: silver, 38'27; tin, 59'58; platinum, 1'34; gold, 0'81. Lawrence's amalgam: silver, 47'87; tin, 33'68; copper, 14'91; gold, 3'54. Moffitt's amalgam: silver, 35'17; tin, 62'01; gold, 2'82. Townsend's amalgam: silver, 40'21; tin, 47'54; copper, 10'63; gold, 1'6. Townsend's improved amalgam: silver, 39'60; tin, 55'63; gold, 5'31. Walker's amalgam: silver, 34'89; tin, 60'01; platinum, 0'96; gold, 4'14.—*Monatsschrift des Vereins deutscher Zahnkuenstler.*

BABYLONIAN ARCHITECTS AND MEASUREMENTS.—Among the Babylonian statues recently acquired for the Louvre are two seated figures of kings or architects, each bearing on his knees a drawing board. Along the front of each board is a "plotting scale" for measuring, with subdivisions on the inner and outer faces. The length is just over ten and one-half inches, or half a cubit, and indicates that the measure used was not the later Assyrian cubit of 21.4 or 21.6, but a variant of the old cubit of 20.63 inches. The earliest measuring rods hitherto known are two mason's cubits of wood from Egypt, of the reign of Hor-em-heb, of the fifteenth century, B. C. The scales from Babylonia are held to be much more ancient, and offer much more accurate testimony in regard to the earliest measurements. Absolute mathematical correctness, however, is not expected in these scales, which are merely adjuncts to statues.

CARPENTERS, cabinet-makers and artisans in in wood generally often encounter a difficulty in withdrawing a screw from work, by the screw turning around under the application of the driver, and refusing to come out of its place. In such a case the screw may have been driven nearly home originally by a hammer instead of with a driver, and hence no regular corresponding thread been formed in the wood. In other cases the screw may have been properly driven with a driver yet in old work the thread may have oxidized from the screw, or the wood about the thread may have decomposed so as to leave the thread of the screw without a matrix. Under either of these circumstances it becomes necessary to wrench off hinges and parts fastened by the screws, and oftentimes to the great injury of the woodwork so assailed and always with that risk. The London *Builder* offers a simple way out of this difficulty viz: The application of heat to the head of the screw which may be done with a heated poker or some such instrument. A few moments of such application of heat will render the withdrawal of such a contrary screw as easy a matter with a driver as it had been recently and properly driven. The *Builder* suggests in driving screws that their tips be dipped in oil in order to defer rusting or oxidizing.

CORRESPONDENCE.

ELECTRIC LIGHTING.

Special Correspondence Engineering News.

ST. PAUL, MINN., Dec. 9, 1883.

EDITOR ENGINEERING NEWS:—Can I get, or would you publish Mr. A. B. Holmes' paper on "Electric Light Fittings Used on the Incandescent System," read before the Liverpool, Eng. Society, on October 19, 1883?

Respectfully,

U. C. MILLER.

[You will have to write the Secretary Liverpool Engineering Society, for the paper.—ED. ENG. NEWS.

Formula for Discharge of Post Hydrants.

Special Correspondence Engineering News.

NEW YORK, Dec, 22, 1883.

EDITOR ENGINEERING NEWS.—I send you a simple formula that I have devised for calculating the discharge of Post Hydrants, as it may be of value to such of your readers as are engaged on water-works.

Assuming the barrel of the hydrant to be vertical and the nozzle 2½ inches in diameter, we have

$$Q = 0.15 \sqrt{\frac{L^2}{2H} + \frac{2}{3} H^2}$$

In which

Q = discharge in cubic feet per second.

L = horizontal range, measured from face of nozzle to point of contact of axis of jet with surface of ground.

H = vertical distance from this last point to centre of hydrant nozzle.

This formula will be found quite accurate for moderate velocities.

The factor of the atmospheric resistence has been neglected, as it was found to unnecessarily complicate the expression, therefore the results obtained will be too small when the velocities are high.

JAMES DUANE,

Assist. Eng. Croton Aqueduct.

SELECTED MISCELLANY.

A CIVIL engineer finds that the fall in the Pemigewasset River from Franklin to Ayer's Island in Bristol, Me., is 110 feet.

PHILADELPHIA'S new post-office which is soon to be occupied, cost about $8,000,000. Its dimensions are, 175 ft. 9 inches on Chestnut street, 175 ft. 1 in. on Market street, and 481 ft. on Ninth street, height of the dome above the curb, 170 ft.

COLORADO—the Denver *Tribune* says—has a settled population of 300,000, and a taxable valuation of $110,000,000, representing an actual property value of $300,000,000. She is traversed by 3,000 miles of railroad, and in 1882 her mines yielded $26,000,000 in gold and lead.

THE new German navy list for 1884 is just issued. The Imperial navy now comprises thirteen ironclads, of which seven are frigates and six corvettes. There are thirty-one cruisers, of which twenty-one are corvettes and ten gunboats, besides thirteen ironclad gunboats and fifteen torpedo boats for coast defence

A CLOCK was set going at Brussels which continued to go for nine months, and had not run down when last heard of. An up draught is obtained in a shaft by exposing it to the sun. This draught turns a fan, which winds up the weight of the clock until it reaches the top. It then works a brake which stops the fan until the weight has gone down a little, when the fan is free to re-commence.

A Southern engineer, Mr. William Golding, of New Orleans, suggests the idea of constructing the frame-work of large exhibition buildings, which must be demolished after brief use, of wrought iron steam pipes of standard length, put together with standard fittings in such a manner that they can be taken apart without injury and sold at a small loss when the building is no longer needed.

AN interesting torpedo experiment was made a few days ago in the roadstead of Toulon, in France. The object was to ascertain whether a torpedo containing 700 kilograms of powder, which had been submerged for six months, was damaged by its protracted contact with water. An explosion was readily affected by the electric current, proving that vitality was maintained, but whether the destructive power was unimpaired is not determined.

AFTER St. Louis had experimented unsatisfactorily with wood, asphalt, granite, and other material for pavements, a hundred public-spirited men contributed $50 each toward a fund to test fire brick for paving purposes. The test was made in the busiest streets. A committee of Engineers and others have just reported that "fire brick show all the endurance of granite, and that they make a smoother, cleaner, and less noisy street, and are more easily repaired and give a better foothold to horses; that neither frost nor fire affects them, and that they can be used at less than half the cost of granite.

THE Standard Coal & Oil Co. is to be reorganized under a new name. The old Company organized only eighteen months ago with a capital of $25,000,000 have made an assignment in Columbus, Ohio. Among the directors and stockholders of the old Company were Jas. G. Blaine, Eugene Hale and Gov. Chas. Foster of Ohio. D. N. Stanton, John F. Mason and Geo. C. Chapman have been chosen Trustees of the new Company, under the name of the Ohio and Western Coal and Iron Co., with a capital stock of $5,000,000. All old stock will be wiped out.

THE St. Paul *Pioneer-Press* gives the following statistics of building in Minneapolis during the last two years.

	1883.	1882.
Numbers of stores built	590	308
Number of residences	2,539	1,847
Expenditure for dwellings	$5,035,701	$1,529,375
Expenditure for stores	3,152,075	2,294,000
Expenditure for miscellaneous buildings	834,300	2,201,700
Aggregate expenditure	9,390,450	8,375,075

"I'VE seen a good many wonderful things in my travels," said John Gregg, commercial traveller, "but the Walled Lake of Iowa rather lays over everything I ever saw. Just imagine a body of water covering nearly 3,000 acres with a wall built up all around it, not a stone in which can be less than 100 pounds in weight, and some as heavy as three tons, and yet there's not a stone to be found within ten miles of the lake. The wall is ten feet high, about fifteen feet wide at the bottom, and may be five on top. The country is prairie land for miles around, except a belt of heavy timber that encircles the lake. The timber is oak, and it is plain that the trees were planted there. They are very large. The belt is probably half a mile wide. The water in the lake is twenty-five feet deep, as cold as ice, and as clear as crystal.

"What I would like to know is, who built that wall? And how did they hold the water back while they were building it? And how did they cart those immense stones for ten miles? If ever you go to Iowa, don't fail to visit the Walled Lake. You'll find it in Wright county, 160 miles from Dubuque. The cars will take you almost to it."

WROUGHT IRON PIPE.

In the manufacture of wrought iron pipe and tubes about fifteen establishments are engaged. The business was fairly good until six months ago, when a market decline began, caused largely by the cutting of prices by different mills. All of them, except those engaged in the manufacture of specialties, have been compelled to reduce prices, and the decline for the past year has amounted to 25 per cent. On December 17th a new price list and discounts in wrought iron pipes were agreed to by all the manufacturers. *The Courier-Journal* says: "It costs $18 to make a ton of iron in the East;" gives the testimony of Frederick Sloss, the Secretary of the Sloss Insurance Company, that iron can be made in Birmingham, Ala., for $11.90 a ton; gives the assertions of others that it can be made for $9 a ton in Alabama, and asserts a clear advantage over Cleveland and Pittsburg of 33⅓ per cent. But the present cost of making iron at the North is $16.50. After Jan. 1st, in consequence of the reduction in wages ordered to take effect on that date, it will be about $15. Leading iron manufacturers say that it has been made for $13, and could be made for that amount now by reducing expenses. Many Northern capitalists, interested in the iron industry, have been offered the most valuable properties in Alabama at their own terms, and if the facts were as stated in *The Courier-Journal*, they would have seized the opportunity to acquire them. After full investigation, they arrived at the conclusion that it would not pay them to go into the business at the South now, nor for twenty years to come, perhaps fifty. When a home market is secured, the rich ore of the Alabama mines will be in demand. But when the result is attained, the "blowing out" of Northern furnaces is not likely to follow. The demand for iron products all over the world will be so greatly increased as to make the industry in Pennsylvania and Ohio more profitable than ever.

A DUPLICATE TUNNEL.

General Joseph E. Johnston, who commanded the Confederate forces engaged in resisting the advance upon Atlanta, once narrated the following incident, which well illustrated the impression Sherman had made upon the minds of the Southern soldiery at that time as a commander of resources and ready expedients. Johnston stood on Kenesaw Mountain, watching with his glass the movements of his enemy's wagon trains on the great plain to the northward. A staff officer came riding up with the news that the rebel cavalry had got in the rear of Sherman's army and had burned a number of railroad bridges. The officer had been forced to make a detour of two days to get around the Union army. Scarcely had he finished speaking when a whistle was heard and a moving train appeared in the distance, showing that Sherman had already rebuilt the bridges and reopened his communications. Walking past a group of soldiers lounging in the shade, a few minutes later, the General overheard them discussing Sherman's chances of success. Said one of them: "We'll make it a Moscow campaign and destroy his whole army." "How can you make it a Moscow campaign without any snow?" asked his less enthusiastic comrade. "I mean that we'll cut his communications, destroy everything and starve him out. We'll burn all the bridges." "Don't you know he carries duplicate bridges along with him?" "Well, we'll blow up the big tunnel." "Oh, h—l!" exclaimed the other man with disgust, "you don't know old Tecumseh Sherman. He's got a duplicate tunnel, too."

Montana for Money Making.

"The greatest opportunity for corporate monopoly and money-making in the country is in Montana to-day," said General James S. Brisbin.

"It is in the power given by law to owners of irrigating ditches," continued the general. "The soil of Montana produces threefold when properly irrigated. Knowing this the Legislature, desiring to encourage agriculture, enacted a law with the preamble that whoever made the soil more productive was a public benefactor. They then proceeded to give the irrigators extraordinary powers. Any one desiring to build an irrigating ditch can run it through your house if it suits him. He may exercise the right of eminent domain over any one but the owner of another ditch. He can't cross another line. Added to this is the fact that the charter runs forever and the charge for irrigating thus becomes a perpetual tax on the land. As to the money in it I will give you an instance: There is a ditch at Billings, Montana, owned by Herman Clark, which is thirty-five miles long, and covers 100,000 acres. It cost $100,000 to dig. At a charge of 50 cents a year for each of the 100,000 acres which it covers it paid $50,000 the first year. I'd rather own the ditch than the land it waters, and I believe that the ownership of such a ditch is the most lucrative occupation in Montana, although the wealth of that Territory is enormous. It lay untouched before the completion of the Northern Pacific Railroad, but now it begins to be developed. As a stock-raising country it beats the world, and when that business is worked out for all it is worth in the Territory beef will fall from twenty-three cents, where it is now, to twelve cents, where it ought to be. As for mineral wealth, the whole country is underlaid with coal and there are silver mines which I believe to be richer than the Comstock Lode. The population has gone from 50,000 last year to 100,000 to-day."

Practical Formulæ, Known as "Trade Secrets."

A Process for Frosting Glass.—To give glass this appearance, it is only necessary to coat it with the following composition: Sulphate of magnesia diluted in beer, with a little dextrine added.

Masonry Impermeable to Acids.—Construct with bricks which have been previously dipped into very thick boiling tar, then lay in a mortar made of rosin and a refractory sand applied hot, and rub the joints with a hot iron.

To Write upon Terra-cotta Tablets.—Dip the clay tablet in milk with a few drops of acid added, and then dry. When this is done you can write upon it as easily as upon paper.

To Render Leather, Paper, etc., Impermeable.—M. M. Huleux and Dreyfus advise the employment of the following mixture, which operates according to the quantity and proportion of the materials added:

	Grammes.
White or Yellow Wax, first quality	1,000
Burgundy Pitch	60
Oil of Arachide	80
Sulphate of Iron	50
Essence of Thyme	20

[*Le Genie Civil.*]

MR. HUNTINGTON, the railroad millionaire, is put down as worth $50,000,000. He is sixty-five years old and has no family of his own blood. An adopted daughter is the sole heiress.

NEWS OF THE WEEK.

Water, Gas and Steam.

MONTPELIER, Vt., has voted to issue $50,000 in bonds to introduce water from Berlin Pond.

THE income of the Keene, N. H., Water Works the past year was $10,000, or over ten per cent.

BELOIT WISCONSIN WATER TOWER is up, and active operations for completion of that work will be commenced this spring.

THE Duluth Gas and Water Works, Carroll E. Gray constructor, is completed, and running very successfully. Also water works at Fergus Falls, Minn., same constructor, are completed.

THE *Cape Ann Advertiser* says that if the city authorities of Gloucester would make a contract for the introduction of water the people would ratify it, two to one.

THE Philadelphia Councils appropriated on Dec. 20, for the coming year, $814,385 to the Water Department of that city; and raised the salary of the Chief Engineer of the Department from $7,000 to $8,000.

CITY Works Commissioner Ropes of Brooklyn, has prepared an act, which will be introduced by the next Legislature, authorizing the extension of the water works beyond Rockville Centre, in order to secure a much needed increase in the water supply of Brooklyn.

THE town commissioners of Easton, Md., have been considering the subject of the supply of water. It is proposed to ask the Legislature for authority to issue $25,000 in bonds by the town government to build water works.

THE tunnel under Lake Michigan that is to give water to Hyde Park, a suburb of Chicago,

has been carried out 2,460 ft. from the shore. It is six feet three inches in vertical diameter, and six feet in horizontal diameter, and has been blasted through solid rock.

THE PORTAGE STRAWBOARD COMPANY, of Akron, have ordered one 600 H. P., one 100 H. P., and four 60 H. P. engines from E. P. Allis & Co., Milwaukee, and one 1,500 H. P. boiler from the Babcock & Wilcox Co., New York, for their extensive new works at Circleville, O.

THE question of water works at Fonda, N. Y., has undoubtedly died the same natural death that all other village improvements have. A large number of citizens are now anxious for the Trustees or Board of Water Commissioners to make some arrangement with the New York Central Railroad by which they can secure water for fire purposes from the large tank recently constructed by the road.

THE new Deane pump at the Lynn, Mass., Water Works, was tested recently by Superintendent Lyon and the engineer. The requirements of the pump were 3,000,000 gallons a day, with a duty of sixty millions. The test showed the gross capacity to be 3,198,324 gallons, and the net 3,060,392 gallons, with a duty of 62,512,285 to one hundred pounds of coal. Everything about the engine and pump are satisfactory, and it is considered the best in the State.

CONTRACTS were let recently by the St. Louis Board of Public Improvements for supplying the city with 1,350 tons of water pipe, sixty tons of special castings, and 260 water plugs. The contract for the water pipe was awarded to the Shickle, Harrison and Howard Iron Company, at $34.95 per ton, and the same firm secured the contract for special castings at $42. The contract for the water plugs was awarded to the St. Louis Iron and Machine Company, at $25 per plug.

THERE is good prospect for speedy construction of water works at Fredonia, N. Y. The board of Water Commissioners have received proposals from $70,000 to $100,000, for putting in the works entire with five and one-half miles of distributing mains and about sixty-five plugs. The water is to be brought from the west branch, a clear stream of spring water three miles away and with an altitude of 225 feet. The reservoir is to be built in the channel of the stream. A dam will be constructed. It is believed that the works can be completed for $85,000,

THE New Croton Aqueduct Commission have adopted the modified route of the proposed aqueduct from the Quaker Bridge dam to the Harlem River. The line begins on the estate of Coop, and runs southerly into and across the Pocanties Valley, and thence into and along the Saw Mill River Valley to a place near South Yonkers, where it will intersect the Hudson River route. From there it will follow the Hudson River route to the Harlem River. The Commissioner of Public Works was instructed to prepare plans and maps for the aqueduct on the new route.

THE GORDON & MAXWELL COMPANY, Hamilton, have contracted to furnish the Hamilton Water Works one of their vertical compound condensing engines, with a daily capacity of 3,000,000 gallons. The cost of the water works is $325,000, and they are to be completed by July 1st, 1884. There is to be a reservoir, and twenty-eight miles of pipe will be laid. This company have recently shipped for the Girl's Industrial Home, near Delaware, O., a condensing pump of 600,000 gallons capacity, one pumping engine for the $120,000 water works at Dixon, Ill.; also a duplex high and low pressure cylinder engine, capacity 1,000,000 gallons, for the water works at Clyde, O.

THE WASTE OF WATER.—Mr. Thomas J. Bell, assistant superintendent of the Cincinnati (Ohio) Water-Works, in the course of a paper written by him upon "The Wastage of Water," gives the following table as representing the daily per capita consumption of five American cities, and claims, with perfect truth, that the great increase of rate is to be charged directly to waste instead of necessity:

	Per capita Rate.	Gals.	Gals.
Boston,	in 1850	30;	in 1881, 92
Brooklyn	in 1866	17;	in 1880, 54
Chicago	in 1867	43;	in 1880, 114
New York	in 1867	62;	in 1876, 100
Philadelphia	in 1867	56;	in 1880, 67
Cincinnati	in 1845	21;	in 1881, 87

AFTER a long and exciting series of town meetings the citizens of Wakefield, Mass., over a year since, voted to accept the proposition of the Wakefield Water Company to introduce water into the town, and the past week the water works were completed. The water is drawn from Crystal Lake, at the southern end of the town, and is supplied for private use by the water company, and the town also pays for the use of sixty-five hydrants at an annual rental of $50 each. The company supply both the towns of Wakefield and Stoneham, and the stand-pipe is located upon a high hill in Stoneham, about a mile from the lake. This pipe is made of wrought iron, and is forty feet in diameter and sixty feet high. It is capable of holding 600,000 gallons of water. The pumping station is a brick structure, and contains two compound condensing duplex engines of a pumping capacity each of about 2,000,000 gallons of water daily. These engines have two independent air pumps and two independent feed pumps. The boilers are two large ones of seventy horse-power each. The contractors for the piping and hydrants were Messrs. Goodhue and Barney, of Springfield, Mass., and under their direction over eleven miles of piping have been laid through the streets of Wakefield. This piping is made of sheet iron, cement lined, and stood the test most admirably of the trial made last week of the hydrants. The water from the lake is of unusually pure character, and the citizens are to be congratulated upon its introduction into their homes. A very pleasant house for the occupancy of the engineer has also been built near the pumping station.

ABOUT a year ago it was discovered that the supply-pipe of the Hyde Park Water-Works did not extend a sufficient distance into Lake Michigan to be effective, and also that there was danger, owing to changes in the bottom of the lake, of its being carried away by a heavy storm. It was therefore deemed best to begin the construction of a six-foot brick tunnel to extend a mile into the lake, which was done, the sum of $50,000 having been included in the last annual appropriation. The question of a further prosecution of the work is prominently before the Board of Trustees, and they have requested the heavier taxpayers of the village to be present at a meeting of the board to be held December 29. The present state of affairs is as follows:

Up to date 2,600 feet of the tunnel have been completed. The Board of Trustees, in its last annual appropriation, provided $50,000 for the prosecution of the work. The sum is nearly exhausted, and the work must be stopped until the next annual appropriation ordinance is passed unless funds are at once raised. It seems to be the unanimous opinion of the Trustees that it would be a misfortune to discontinue the work, and it now remains to be seen how the necessary funds can be raised. The following plan is being discussed: By retiring a small amount of outstanding bonds, the money for which is now in the Treasury, bonds to the amount of $50,000, drawing interest at 5 per cent. or less, can be issued, and, it is thought, can be floated at par. It is the opinion of the engineer in charge that $80,000 in addition to what has already been expended will complete the tunnel and crib, and that they will be ready for use in the fall of 1884, if the work is vigorously prosecuted. The next annual appropriation ordinance can be passed as early as May, 1884, and if $50,000 is appropriated for the completion of the tunnel, that amount, with the money raised by the issue of bonds as mentioned, will be sufficient to prosecute the work without interruption. The remaining $20,000 it is proposed to use in equipping a fire department.—*Chicago Tribune.*

Bridges.

OTTAWA, Dec. 22. Application will be made to Parliament for a charter to construct a high level bridge across the St. Lawrence River at Quebec.

URBANA, Dec. 11. Yesterday the new iron bridge on the N. Y. P. & O. and P., C. St. L. Railways—a span 179 feet—was formally opened by the county commissioners and city council, and is now being used. The structure was built by the King Iron Bridge Company, of Cleveland, at a cost of about $21,000 and proved entirely satisfactory.

THE largest contract ever let for foundations of bridge-piers to be put in by the pneumatic process has been awarded to William Sooy Smith & Son, engineers and contractors, of this city, by the Baltimore & Ohio Railroad Co. for the foundations of its great bridge across the Susquehanna River on its new line from Baltimore to Philadelphia.

THE BRIDGE AT ST. JOHN, N. B.—This important work, which is exciting much attention among railway men generally, is intended to connect the Western system of railway having its Eastern terminus at Carleton, opposite St. John, N. B., with the Intercolonial system which extends through New Brunswick and Novia Scotia. When it is finished through trains can be run West and East, thus saving present inconvenience of trucking and carting freight through the city and across the river in ferryboats.

The extension starts from the new passenger depot now in course of construction by the Intercolonial Railway, and following along the north side of the harbor, crosses the river at a point about 100 feet above the present suspension bridge, and joins the New Brunswick Railway at Fairville.

The point where the railway will cross the river St. John is a deep gorge about 500 feet in width, and the bridge, which will be a steel cantilever truss, will be composed of one center span of 467 feet clear, and two shore spans of about 150 feet each. It will rest on two granite piers about 95 feet high.

"The St. John Bridge and Railway Extension Company" are the incorporators of the enterprise, and the work of constructing the whole extension has been intrusted to the "Dominion Bridge Company," J. Abbott, Esq., President and Chief Engineer, who have associated with them Mr. M. J. Hogan of Quebec. Mr. P. S. Archibald is Chief Engineer for the Extension Company, assisted by Mr. Gilmour Brown. The distance from the Intercolonial Depot to the point where the junction is made with the New Brunswick Railway is about two miles. The work, which is mostly of a heavy character, is being pushed forward with vigor, and it is expected that the road will be ready for traffic by August, 1884.—*Official Guide.*

Streets, Drainage, Sewerage, Etc.

A CIVIL engineer is now engaged in making a survey at Old Orchard, Me., for a system of drainage and sewerage, under the direction of the Selectmen.

THE Sanitary Inspector who investigated an out-break of typhoid fever in a populous district in London traced the epidemic to a dairy-farm, where the vessels used for containing milk were washed with water from a well befouled by drainage leaking from a cesspool. At Port Jervis, N. Y. the cause of a similar outbreak of disease was traced to a farm whence fifty-six out of the seventy-five persons affected were supplied with milk from that farm. In a certain stable the horses were attacked by a malignant disease of the throat. Several died before it was discovered by the veterinarian, who had been called in to investigate, that the horses were supplied with water from a well which was only eight feet from a stall in which some of the horses stood, and that, in addition to the poisonous matters the well received from the drainage of the stable, a hen which had fallen into the well had been allowed to decay in the water. It should be remembered that water which is clear, sparkling, and free from odor may be most poisonous. The water from no well to which the contamination from a cesspool, stable, manure-pile, or decaying animal or vegetable matter of any kind can gain access should be used by human beings or for watering animals.

SEWERS IN KANSAS CITY.—"I find, by looking over department reports of Chicago," said City Engineer Knight, "that during 1882 we built seven miles more of sewers than Chicago did. Twenty-five miles were constructed in Kansas City, while Chicago only built eighteen. The average cost was about the same in both cities."

Mr. Knight is preparing plans for the construction of a sewer on Henning street, to extend from Union avenue north to the river. The sewer is intended to furnish more adequate drainage for property along Bluff street, Lincoln street, Freight street, the Hannibal and St. Joseph yards, the Union Depot and portions of Union avenue. It will be of large size and with a good grade.

In connection with the matter of changing the channel of O K creek and improving the condition of the stream in the vicinity of Eighteenth street from Harrison street to Forest avenue, the city engineer has made surveys, and is estimating the costs of three different plans for straightening and improving the bed of O K creek. A report on this subject will be submitted to the city council at an early day.

Mr. Knight has also prepared a grade map, showing the street grades along O K creek from Grand avenue to the city limits east, with a view of raising the grades on Eighteenth street and making a uniform system of higher and better grades all through the valley. This work has been done at the request of property owners beyond the flooded district and along the valley, who are desirous of being brought up out of the hollow and placed beyond the reach of high water.

The city engineer is engaged likewise in the work of making a topographical survey of the watershed and valley of the O K creek in connection with designing plans for a sewer system in that region. The work is being done in a thorough manner, and as rapidly as the limited appropriation for that purpose will permit.—*Kansas City Times.*

Railroads.

THE last spike in the Pittsburgh, Cleveland and Toledo Railroad, from Newcastle Junction, Pa., to Akron, Ohio, eighty miles, was driven on December 20th by the President of the road, C. H. Andrews. This is an important link in the grand trunk scheme of the Baltimore and Ohio.

THE New York Central Railroad Company will not allow any palace cars other than Wagner's to be taken over its road; hence the Patti car, manufactured for the Mann Boudoir Car Company by the Gilbert & Bush Company, had to be shipped to New York via the Delaware and Hudson Road to Albany, the Boston and Albany to Springfield, and the New York and New Haven Railroad to New York.

THE Passadumkeag, Me. Railroad Company will soon organize and hope to build a part of its road the ensuing season. This road extends along the Passadumkeag River about twenty miles up from the town of Passadumkeag. It is also expected that the Penobscot Central Railroad, running on the Kenduskeag Valley, will be commenced next year. Hon. John Morrison, of Corinth is confident of its being built.

NEW YORK, Dec. 22.—The Directors of the Wyoming, Yellowstone Park & Pacific Railway Company, elected the following officers: President, L. D. Shoemaker; Vice-President, S. H. Wallace; Secretary, H. M. Munsell, Treasurer, James D. Powers; Managing Director, John R. Bothwell. It is stated that the company will begin next spring the construction of an extensive railroad system in Wyoming and the adjacent territories.

A DISPATCH from Easton, Pa., says that the attorneys of the Pennsylvania, Slatington and New England Roads have finished paying off all claims against the company, either in sheriffs' hands or in those of individuals. A contract has been signed with C. C. Campbell, of New York, to build the road through from Slatington, Pa., to Pine Island, N. J., within sixty working days, after which the company will thoroughly equip the line. It will be the shortest from the anthracite coal and slate region of Pennsylvania to the Hudson above New York.

THE Providence, Webster & Springfield Railroad Company have constructed their railroad this year from its junction with the Boston and Albany Railroad two miles east of Rochdale, Mass., to its present terminus at North Webster, Mass.; distance, 9⅝ miles. Track laying has just been completed. The road is to be leased and operated by the Boston & Albany Railroad Company, and will be opened for business next year. Thos. F. Chappell is Chief Engineer, and Mr. H. H. Slater, of Webster, Mass., is President of the company.

TO THE EDITOR OF THE SUN—Sir: I noticed in yesterday's *Sun* a paragraph to the effect that the fastest actual time made on American railroads was at the rate of 62½ miles per hour. I desire to say that last summer I rode on a regular train (the two-hour train between Philadelphia and New York) of the Bound Brook line at the rate of a mile in forty eight seconds, or seventy-five miles per hour. The train consisted of four cars, and was drawn by New Jersey Central engine No. 169. It is a common thing for the fast trains on this road and the Pennsylvania to make a mile in fifty-seconds. JERSEY.

THE bill introduced by Senator Cullom, December 20th, to establish a Board of Railroad Commissioners to regulate inter-State commerce, provides for the appointment by the President of a board of five commissioners, with a salary of $5,000 each per annum, who shall exercise supervision over inter-State commerce of railroads, canals and other transportation companies and over commerce with foreign countries, and who shall investigate all complaints which may be made by Railroad Commissioners of States and others of discriminations in the charges made by such transportation companies for their service as common carriers.

HARRISBURG, December 24.—Application was made at the State Department to-day for a charter to Bloomsburg and Sullivan Railroad Company, to build a line forty-six miles long between Bloomsburg and the village of Bernice, Sullivan county. The capital stock is $500,000. The directors are John Jameson, president, of Bloomsburg; Silas W. Henry, Stillwater; David Lowenberg, Bloomsburg; Charles R. Buckalew, Bloomsburg; Henry M. Palmer, Wilkesbarre; John R. Guotz and Isaah F. Mikeloy, Bloomsburg, and John R. F. Ryan, Williamsport. Jameson and Buckalew are credited with the ownership of nearly all the stock. Owing to the absence of Governor Pattison and Secretary Stenger no action was taken on the application for a charter.

THE boring of the Vosburg tunnel on the Lehigh Valley Railroad has already gone through 1,800 feet. The tunnel will be 3,800 feet long. It is illuminated by electric light.

AN engineering party of fifteen is busily engaged in surveying a new line from St. Louis to Kansas City, and it is believed that the work is being done in the interest of the Atchison, Topeka and Santa Fe Railroad, which has a branch line terminating at Pleasant Hill, Missouri, and is known to be anxious for an outlet across the State to the Mississippi river.

BOZEMAN, Mont., Dec. 22.—The engineers of the Utah Northern Narrow-Gauge Branch of the Union Pacific Railroad are surveying the Gallatin extension of the National Park Branch through Bozeman, where the company has recently acquired large coal interests, to Gallatin City, near the headwaters of the Missouri. It is understood that the Park Branch will be built early in the spring, and eventually extended to Fort Benton, the head of navigation of the Missouri, and to a connection with the Canadian Pacific.

RUSSIA adopted the 5 ft. gauge, for the very purpose, it was said, of making it different from that of the roads in the countries west of it, so that they might not be able to use its roads should they invade Russia. It has recently dawned upon the Russians that as the Americans have been able to change the gauge of several hundred miles of railroad in a single day, the Germans or Austrians could probably change the gauge of the Russian roads quite as fast as they could invade the country, and have the use of their enormous rolling stock in supplying the army of invasion. They fear, however, that should Russia invade one of these countries, it would not be so easy to widen the gauge to suit the Russian rolling stock, and they begin to think that their peculiar national gauge, to maintain which they have assumed the cost of transferring all freights crossing the border, and which, therefore, in time of peace is universally regarded as a disadvantage, in time of war will be an obstacle to no one but themselves.—*Railroad Gazette.*

LOCKPORT, N. Y., Dec. 26.—Niagara river is apparently to be spanned by another railroad bridge at no very distant date. It is stated that Congressman R. S. Stevens, of Attica, who is a railroad builder of extended experience, and President of the projected railroad from Attica, through Lockport, to Youngstown, at the mouth of Niagara river, has in his hands and will introduce early in the present Congress a bill authorizing the construction of a new cantilever railroad bridge over the Niagara river at or near Lewiston. A bill granting similar rights will be introduced in the Canadian Parliament early in the forthcoming session, and will doubtless pass. It is understood that the Grand Trunk Railroad is at the bottom of the scheme, which will give its road direct connection with the Rome, Watertown and Ogdensburg Road at Lewiston, without the steep grade of the hill necessary to get to the old Suspension bridge. Congressman Stevens is interested in the new bridge, as it will give his new road a northern and western outlet, and it is thought that the Grand Trunk will acquire control of the Rome, Watertown and Ogdensburg Road if the bridge charter is granted. Its money, at least, will build the bridge.

The preliminary papers were to-day prepared for a charter and stock subscription for a new railroad of standard gauge, to run from Lockport to Olcott, a popular summer resort and thriving lake port twelve miles north of this city. The projectors of this road are prominent Olcott people, who will hold a meeting next week. This road is designed to connect at Lockport either with the new Lockport, Attica and Youngstown Road or with the New York Central, and has received encouragement from both companies. It will give a first-class coal and fruit shipping station to either road which operates it. Experts estimate it can be built for $100,000, including right of way.

PITTSBURG, Dec. 22.—Several months ago it was stated that the chief reason why the contracts for the construction of the Harrisburg and Western Railroad Vanderbilt's line across the southern portion of the State, were not awarded, was the fact that the only eligible, route for a railroad through that territory was held by E. K. Hyndman, of this city, and that he was not disposed to surrender the franchise. Mr. Hyndman, as is well known, has held prominent positions in the Baltimore and Ohio and the Pittsburg and Western Railroad management. He was the first president of the Junction road, and is now engaged in extensive railroad enterprises in the South. When the project of building a railroad across the State to connect the Reading and Vanderbilt systems, was first seriously considered, a company was organized by local capitalists, under the name of the Pittsburg and Atlantic Railroad company. A charter was obtained and a line located from Shippensburg, the western terminus of the Reading, to Connellsville, where the Vanderbilt lines could be tapped.

Mr. Hyndman purchased the Pittsburg and Atlantic franchise for $25,000. Vanderbilt's agents spent several months in an endeavor to induce him to sell, but did not succeed. Then the engineer corps were sent out, and a new line, with heavy grades, long tunnels and bridges, was surveyed. Mr. Hyndman was given to know that his franchise was not wanted at any price. He did not throw it in the market, however, but smiled cynically whenever statements were published concerning the intentions of Vanderbilt. To-day it leaked out that a short time ago the Vanderbilt agents renewed negotiations with Mr. Hyndman, and at last they have received the coveted franchise, and are in a position to build the Harrisburg and Western as soon as they desire. The amount Mr. Hyndman is to receive is one of the things that cannot be ascertained at present, but it is known that it is to be representen by stock, and the par value of this is estimated to be all the way from $100,000 to $1,000,000.

PENNSYLVANIA SCHUYLKILL VALLEY RAILROAD.—Work is progressing rapidly. Proposals are being received for three bridges across the Schuylkill—two at Poplar Bend and the other at Reading. Poplar Bend is between Naomi and the property owned by the Angelica Land Improvement Company, south of Reading. One of these bridges will be 900 ft. long and 70 ft. above the river, and the other 700 ft. long and 61 ft. above the water. In both the river spans will be 167 ft., and there will be spans 95 ft. long on the girders. They will be truss bridges, connected by pins, and made of the best wrought iron, upon plans prepared by engineer Wilson, and constructed in the best manner to accommodate trains running at a high rate of speed. The bridge near Reading will be at the mouth of Wyomessing creek, and will be 750 ft. long and 27 ft. above the river. It will be a handsome structure, similar in design to the Poplar Bend bridges, and built in the same substantial manner.

Mr, J. U. Crawford, the engineer in charge of the work, stated recently that between Phœnixville and Birdsboro, the grading is about completed and a large part of it sub-ballasted. The masonry on this portion is all completed, and the road is ready for the track from Phœnixville to Monocacy. The workmen at the Phœnixville tunnel are taking up the bottom at the rate of 250 feet per month. Something over 200 foet have already been taken up and they are now preparing to put up the arching. The tunnel is 800 feet long, and engineer Crawford thought it should be completed by the end of February. Across the top of the divide, under which the tunnel lies, a temporary track has been laid from Phœnixvile to French creek to forward the laying of track toward Pottstown in advance of the completion of the tunnel. The road between these two points can be opened as soon as the tunnel is completed. There are a few canal bridges between Phœnixville and Pottstown and one over the Schuylkill. Everything has been prepared to put these bridges in position, and as soon as the road reaches Spring City the bridges will be erected and the road pushed on toward Pottstown. Between Birdsboro and Reading the grading is about two-thirds done. At Poplar Bend the cribs for the river piers have been sunk and much of the stone delivered. The masonry work will be pushed all winter, so that it will be possible to raise all the bridges early in the spring.

Between Phœnixville and Perkiomen the grading is completed. The masonry on this part of the road is about two-thirds done, and the most difficult part of the work finished. The work between Perkiomen and Norristown will be in running order in about three months. Tracks have been laid through Norristown, running along Lafayette street from one end to the other. The grading of the portion between Norristown and Conshohocken will be completed within two weeks. Track-laying is going on on part of this section, so that when the Manayunk bridge is put up trains can be run through to Norristown at once.

Mr. Crawford thought that there was a reasonable expectation that trains can be run from Philadelphia to Norristown in March. The road will be opened to Pottstown in April, and to Reading in August or September. These expectations might be disappointed by circumstances which could not be controlled, as a severe winter or other unforseen possibilities; but the present calculation is that the road will be opened as stated above. The track will be the excellent Pennsylvania standard, stone ballast and steel rails, sixty pounds to the yard.